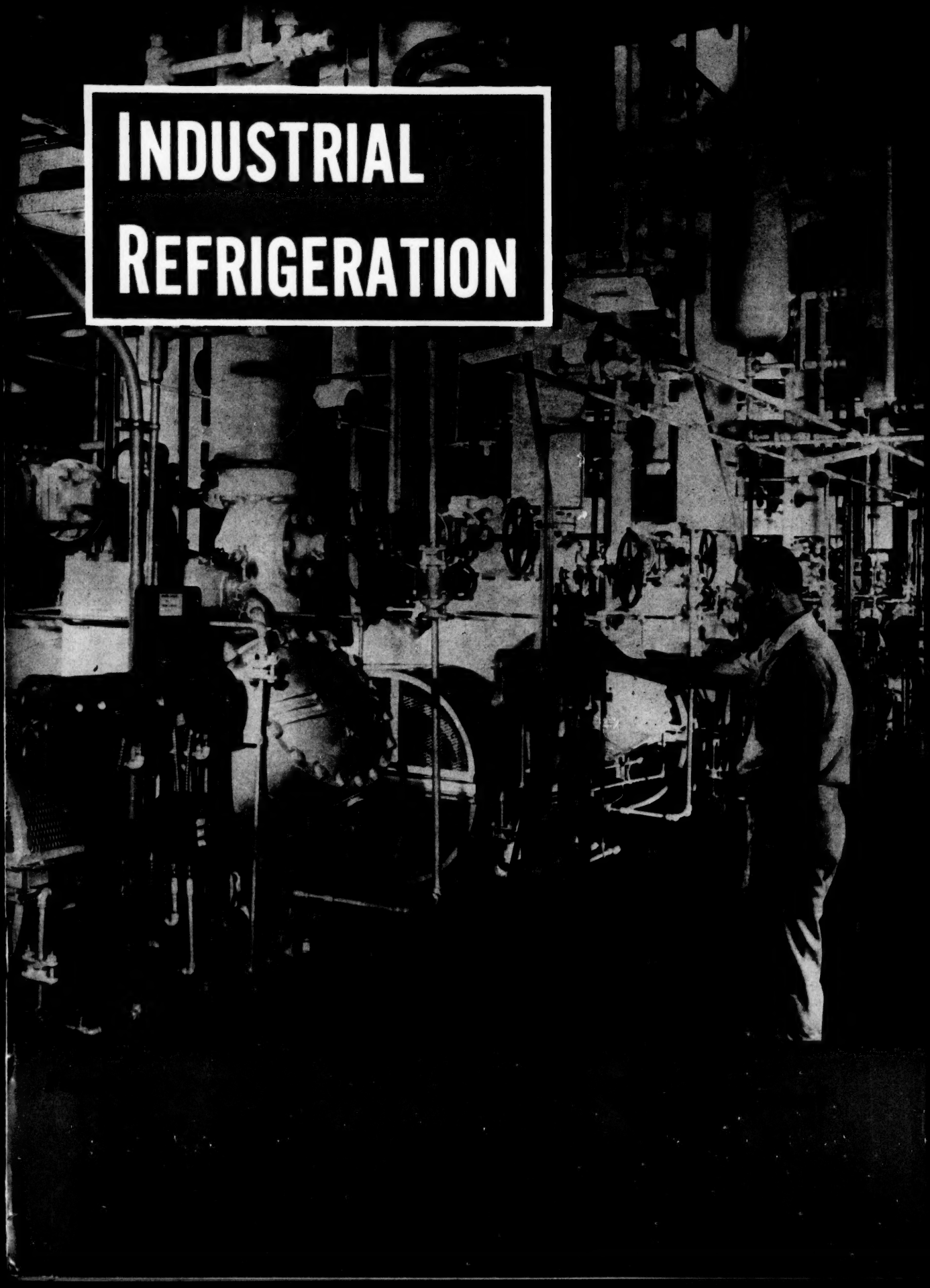
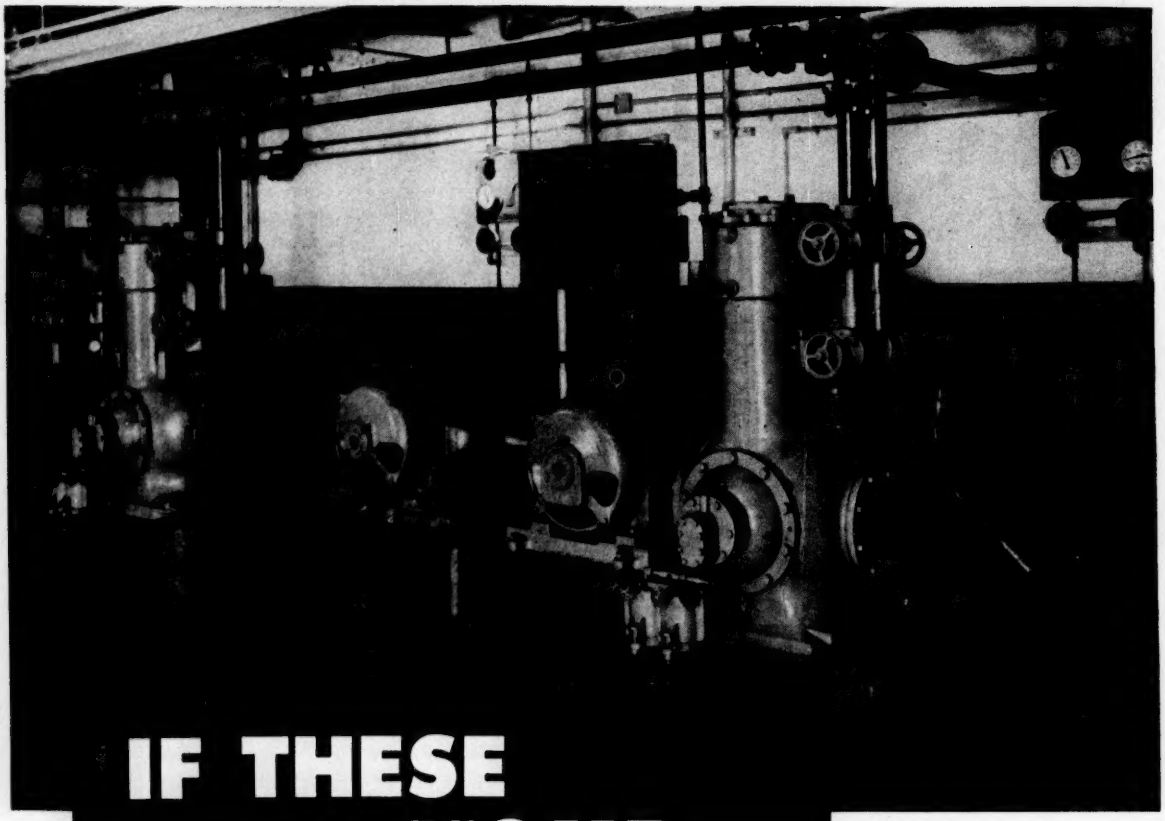
INDUSTRIAL REFRIGERATION





IF THESE WERE *YOUR* COMPRESSORS

YOU'D GET the most refrigeration tonnage per dollar by lubricating with *Texaco Capella Oil (Waxfree)*. And that's true for every compressor, regardless of type or size.

Texaco Capella Oil (Waxfree), as the name implies, is free of wax. Even when you refrigerate down to minus 100°F., *Texaco Capella Oil (Waxfree)* won't wax out in the system. Haze and floc temperatures are extraordinarily low.

In addition, *Texaco Capella Oil (Waxfree)* has outstanding stability and resistance to oxidation. It does not foam, is moisture-free, and does not react with refrigerants.

There is a complete line of *Texaco Capella Oils (Waxfree)*, available in 55-gallon drums, 5-gallon, 1-gallon and 1-quart containers — all *refinery-sealed* to protect their purity. Let a Texaco Lubrication Engineer help you select the one that's exactly right for you.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

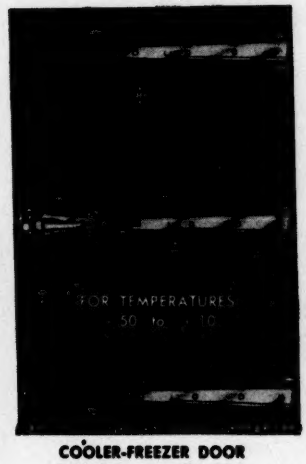
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

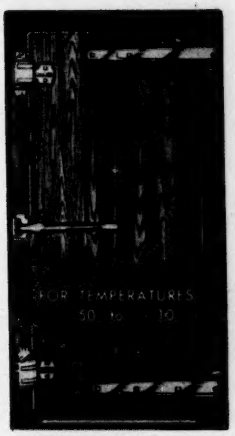
TEXACO Capella Oils (Waxfree)

FOR ALL REFRIGERATING AND AIR CONDITIONING COMPRESSORS

Circle No. 1 on Reader Service Card



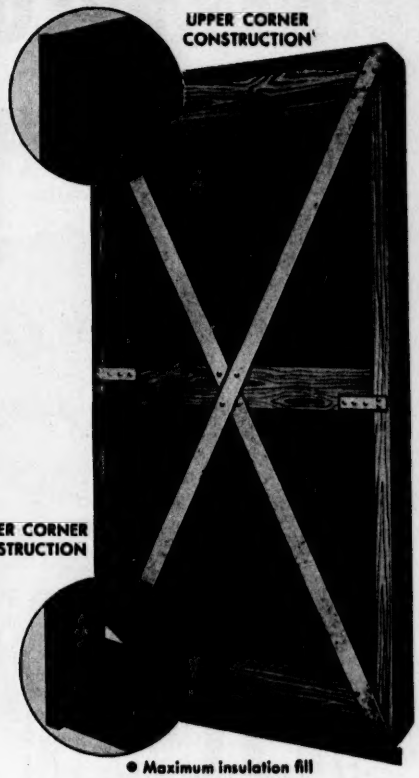
COOLER-FREEZER DOOR
- Modern streamlined job
- 100% "Douglas Fir"
- Sanitary hardware



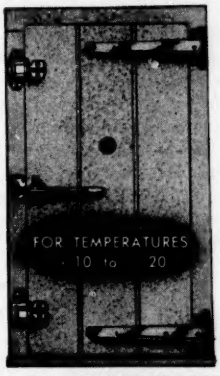
X-52 PLYWOOD PANEL DOOR
- Plywood front and back
- Extra heavy-duty hardware
- Special type gaskets

UPPER CORNER CONSTRUCTION

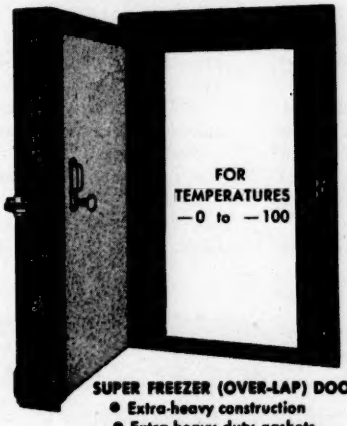
LOWER CORNER CONSTRUCTION



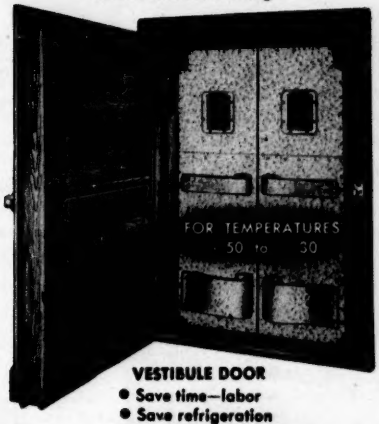
- Maximum insulation fill
- Most possible rigidity
- Allows reversal of swing



LOW TEMPERATURE DOOR
- Entire metal-clad front
- Extra heavy-duty hardware
- Special type gaskets

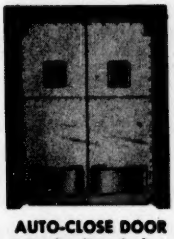


SUPER FREEZER (OVER-LAP) DOOR
- Extra-heavy construction
- Extra-heavy duty gaskets
- Extra heavy-duty hardware

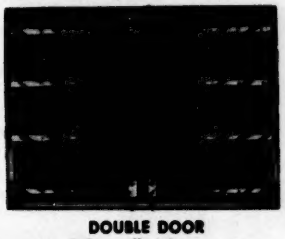


VESTIBULE DOOR
- Save time—labor
- Save refrigeration
- Large plant operation

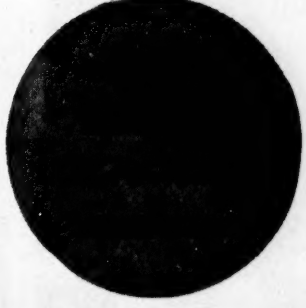
TRACK DOOR
- For abattoirs
- Meat handling rails
- Banana rooms



AUTO-CLOSE DOOR
- For loading dock
- Intra-cooler doors
- Heavy trucking



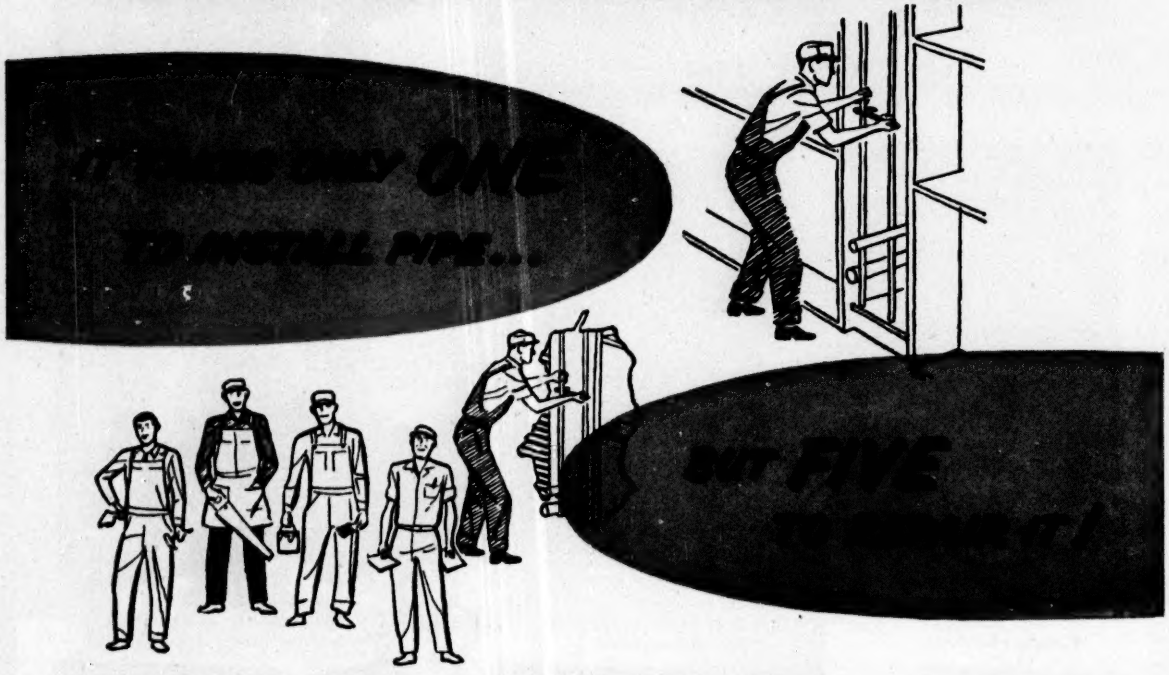
DOUBLE DOOR
- For palletizing
- For carloading
- For elevator shafts



BUTCHER BOY REFRIGERATOR DOOR CO. • HARVARD, ILL.

Circle No. 2 on Reader Service Card

Here's why CORROSION COSTS YOU MORE than WROUGHT IRON



One of the most convincing demonstrations of the economy of using *durable* material is a pipe repair job where low-first-cost material has failed—and is being replaced.

The original installation had been quickly made by plumbers. But the replacement calls for hours of work by as many as five crafts: plumber, mason, plasterer, carpenter, painter. Often, maintenance is billed at overtime rates. And this is only part of the cost story. Production slow-down, disrupted routine may amount to far more than the maintenance charges.

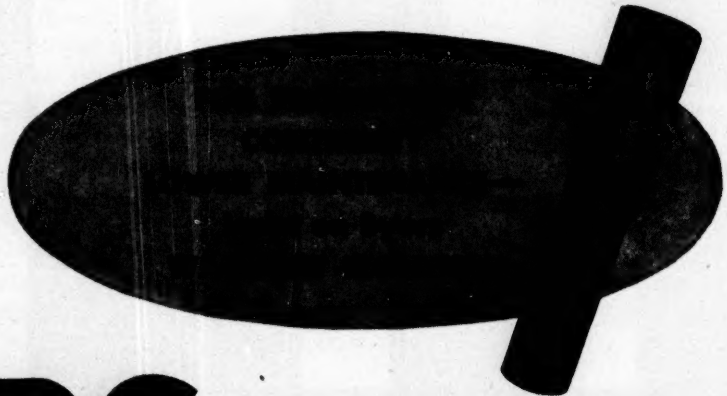
Fortunately there's an answer to pipe durability in corrosive services—Byers Wrought Iron pipe. In literally thousands of applications where corrosion is a threat, the use of this material has proved the soundest kind of economy move.

The next time you specify or approve pipe, you'll find it profitable to investigate the durability records of wrought iron.

Our bulletin, "The ABC's of Wrought Iron," gives the what, why and where of this material. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, New York.

Remember— the pipe that lasts the longest costs the least!



BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

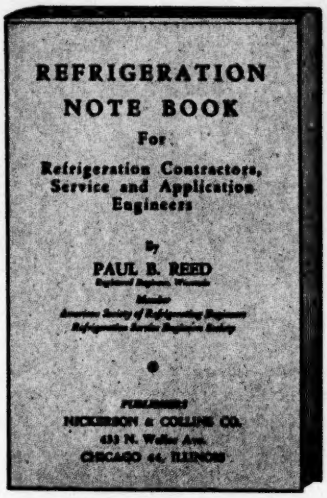
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Circle No. 3 on Reader Service Card

A Vest Pocket Book of Valuable Data

REFRIGERATION NOTE BOOK

by PAUL B. REED



Vest Pocket Size—3¼ x 5 inches
204 Pages—Flexible Binding

THIS NOTE BOOK of condensed refrigeration information represents many years of work in accumulating practical data—"culling out" all extraneous material—so as the author states, "the reader will find a handy and easily carried source of information not usually kept in memory."

You will be surprised at the wealth of material that has been included in this convenient and practical reference Note Book. It is written in layman's language, without complicated formulas. In short, it is a tool responsible for the operation of refrigeration equipment.

$2.00 Postpaid

Nickerson & Collins Co., Publishers
433 N. Waller Ave., Chicago 44, Ill.

Circle No. 4 on Reader Service Card

Industrial Refrigeration

formerly ICE AND REFRIGERATION

Now in its 62nd Year of Publication

J. F. NICKERSON, FOUNDER

VOL. 125 SEPTEMBER, 1953 NUMBER 3

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Cover

• Refrigeration compressors installed at Hawaiian Pineapple Co., Ltd., Honolulu, the world's largest plant for concentrating and freezing pineapple juice and pineapple chunks.

One of the 2-4 cylinder Carrier reciprocating ammonia compressors having 170 tons refrigerating capacity at high suction temperature operates on the vapor condenser of the concentrate evaporative system. The other operates as the high stage compressor of the minus 10 freezer storage room system taking its 30 ton load from a 25 hp Fuller rotary low stage compressor.

There are 3-6 cylinder compressors each of 85 tons capacity at 5 F suction temperature which handle 3 other refrigeration loads in the plant. One of these is the blending and essence cold wall tank system totaling 13 tons; the 2nd an 84 ton cold wall tank system for holding partial concentrate and the 3rd is the high stage load of the 96.6 ton freezing tunnel which has 2 60-hp Fuller rotary compressors on the low stage.

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H. T. McDERMOTT, EDITOR AND PUBLISHER
E. R. CURRY, MANAGING EDITOR
J. R. KELAHAN, TECHNICAL EDITOR
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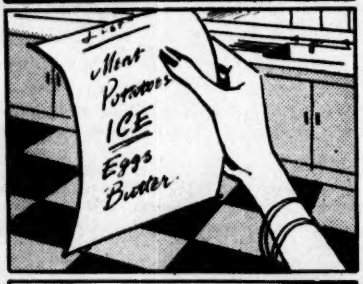
TAKE A TIP FROM A COMPANY THAT HAS MADE IT PAY

"I'm right on the sales firing line," says this drive-in attendant. "I *know* that Union Ice Bags give satisfaction."

Good-looking, dependable wet-strength Union Ice Bags hold up, even in hot weather. Atlantic, which operates in the South, has been using Union Ice Bags since the company first began to sell packaged ice.



OWNERS of "drive-ins" are on the alert for new lines that build traffic. Processed ice in convenient paper sacks not only stops passing motorists, but brings customers from miles away.

UNLIKE many traffic-building items, packaged ice is profitable in itself. The retailer earns a full mark-up on every sale. Packaged ice sales are truly extra business, because the customer who takes home a bag of ice does not buy it at the expense of something else.

REPEAT business is a packaged ice dividend. When folks know where they can get conveniently-packaged ice, in the form they want it, when they want it, they quickly develop the habit of going back.

OTHER items benefit too. You can safely assure retailers that sales of packaged ice stimulate more business throughout the store. Beer, ice cream, carbonated beverages, frozen foods, specialties like watermelon, are just a few examples.

Circle No. 5 on Reader Service Card

What's New

MACHINERY
APPLIANCES • PROCESSES

For your convenience in securing additional information on any product desired, use the convenient Reader Inquiry Card.

New Cellular Concrete

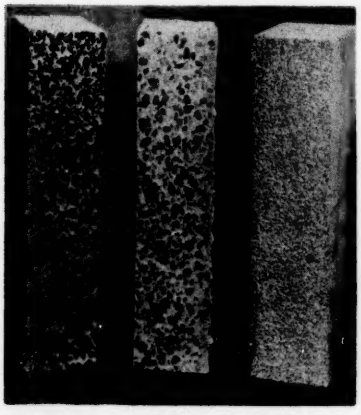
A VERSATILE cellular concrete which can be nailed, sawed and cut like wood which has insulating, load bearing, acoustical and water resisting qualities for walls, roofs, partitions and firedoor cores is being introduced in the United States. A European development, the material will be manufactured in this country under the tradename of "Calsi-crete." Patents on the process are held by the Calsi-crete Corporation, Saginaw, Mich.

Calsi-crete may be sawed with regular or carborundum saw

Three types of the lightweight material will be manufactured, each varying in strength and other characteristics, depending on the particular application. Franchises will be issued to firms throughout the nation for manufacture of the structural type materials.

Calsi-crete has a bulk density of 40 to 55 pounds per cubic foot. Its strength is such that it can be used for nearly all building needs. In weight this compares with regular concrete weighing approximately 150 pounds per cubic foot.

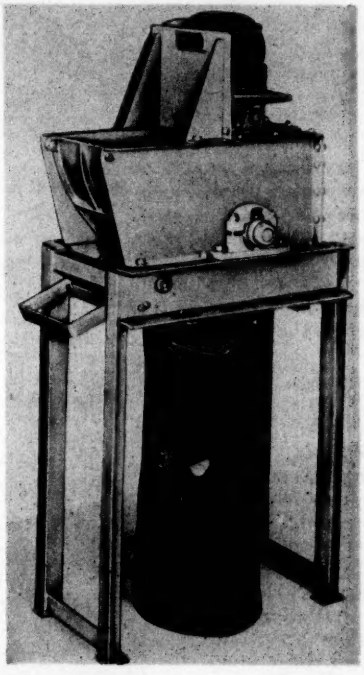
For additional information, Circle No. 62 on Reader Inquiry Card.



Densities of calsi-crete include left to right: 50 lb., 44 lb., and 20 lb./ cu. ft.

Gifford-Wood New Ice Breaker

A NEW 10-ton-per-hour ice breaker which comes already mounted on structural steel leg supports is announced by Gifford-Wood Company, Hudson, N. Y. The breaker is so designed that standard 25 or 50-lb. paper bags or 100-lb. metal-bottom bags are filled direct from the crusher outlet.



New Gifford Wood Ice Breaker

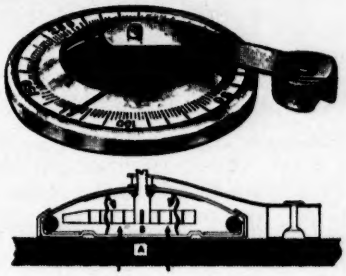
Two discharge spouts are available, one for the small bags, one for the large size. An easily-operated handle permits the operator to set the breaker to crush ice into pieces from ⅝ to 3 in. in size.

The breaker is 24 in. wide x 34 in. long and requires 5½ sq. ft. of floor space. The hopper opening measures 12½ in. x 14¼ in. and is at a convenient height for loading. The drum has 10 picks. The coarse comb has six teeth; fine comb, 11 teeth. The breaker is driven by an integral 1 hp motor.

For additional information, Circle No. 61 on Reader Inquiry Card.

Surface Temperature Thermometers

NEW models in the line of surface temperature thermometers for the fast and accurate checking of the outside temperature of pipes, plastic dies and rubber molds; for the checking of journals and other bearings, electric motors and cylinder blocks are announced by Pacific Transducer Corp., Los Angeles, Calif. The ranges of the new thermometers are as follows: Model 311F from 75 to 375 F and Model 311C from 25 to 190 C in 2 degree increments.



New surface temperature thermometer.

Also with the thermometer is furnished a small magnetic clamp which will hold it securely in place when applying it on steel dies or other ferrous surfaces. The thermometer may be placed on pipes carrying heated or cooled liquid by affixing it in place by either the magnetic clamp or the silicone grease.

The Models 311F and 311C surface temperature thermometers are 2 inches in diameter. Total weight each is one ounce.

For additional information, Circle No. 66 on Reader Inquiry Card.

Palco Insulation Board

COMMERCIAL production of Palco Insulation Board for use in floors, walls, roofs, and self-sustaining partitions of cold storage and freezer rooms has been announced by The Pacific Lumber Company following research development and field testing of the product. The 2-inch thick board is available in standard sizes of 12 x 36 in., 18 x 36 in., 24 x 48 in., and special sizes up to 48 x 72 in.

Low thermal conductivity (K factor) of .30 Btu, and low moisture absorption, it is claimed, makes Palco Insulation Board particularly effective for cold storage and other commercial applications. Compressive strength is rated at 7.06 psi, offering ample supportive strength for concrete or other types of flooring. Combination of light weight, 11 lbs. plus or minus per cubic foot, and high transverse strength of 68 to 76 lbs., are claimed as advantages.

For additional information, Circle No. 67 on Reader Inquiry Card.

Don D. W. Lambert, Jr., United's District Manager, Albany, with William Finke, President of Finke's Ice Cream Company, standing in front of a Can-Passing Vestibule discussing its merits.

"NO INSULATION MAINTENANCE NEEDED OVER 20-YEAR PERIOD"

"We made our first installation of United Cork Companies' corkboard insulation at our ice cream plant in 1933," reports Bill Finke. "Engineers from United Cork's Albany office worked closely with us in the design of the installation, and United Cork crews handled the complete erection job.

"Because the original installation was so effective, we have consistently used United Cork Companies' products and engineering services in the many expansions we have made in our refrigerated spaces since 1933. None of the corkboard has required any maintenance attention.

"We have had no hesitation in recommending United Cork Companies to our distributors when they were planning insulation jobs."

Local Engineering Service

Finke Ice Cream Company, like thousands of other companies requiring low-temperature insulation, benefited by the on-the-spot engineering and erection service offered by United Cork Companies' chain of branch offices located throughout the country. Engineers and erection crews at these offices are prepared to work closely with plant owners, architects, general contractors and refrigeration contractors in planning and making the complete insulation installation.

These services assure the most effective use of the outstanding insulation advantages inherent in United Cork's BB (Block-Baker) Corkboard. BB Corkboard is made from carefully selected grades of cork, and the granules are block-baked, by a patented process, to form corkboard which contains no added binder.

Integrated Responsibility

United Cork Companies thus offers unified responsibility at every stage from the selection of raw materials through the manufacture of the corkboard to its complete erection. The branch office handling the engineering and installation also checks on performance to assure complete customer satisfaction.

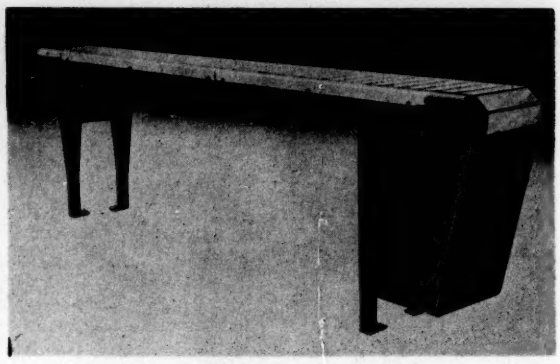
For detailed information on the scope of United Cork Companies' services—and on the performance of installations under the most severe service conditions—just write to United Cork Companies, Dept. I-6, Kearny, N. J.

Circle No. 6 on Reader Service Card

New Equipment Cont.

Metal Belt Conveyor

A NEW development in metal belt conveyors made by the M-H Standard Company, is called "Armorbelt." These conveyors according to the manufacturer can carry loads ranging from a few ounces up to 16 tons and will resist wear, heat, cold, high impact, oils, etc.



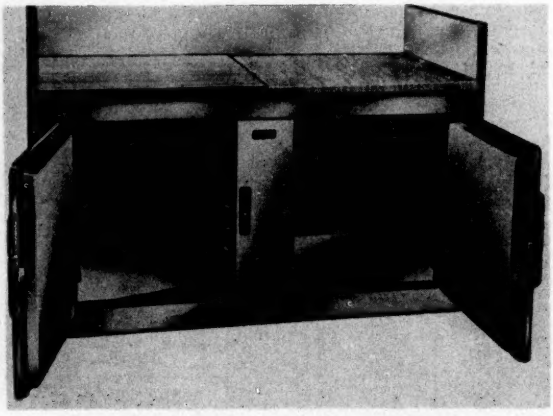
New Armorbelt metal belt conveyor

Power requirements are kept to a minimum by having the entire belt run on protected ball bearings. The individual metal link construction eliminates belt tracking problems. Cases, crates etc. can be pulled off or pushed onto the Armorbelt from the sides. It may become a production line by bolting or welding jigs and fixtures to the steel belt links.

For additional information, Circle No. 52 on Reader Service Card.

Pizza Dough Retarder

PIZZA Pie dough can now be prepared long in advance and used only as needed for the Dunhill Soda Fountain Corp. has introduced a Dough Retarder for pizza pie bakers and restauranteurs. The retarder section is large enough to hold trays for over 70 pizzas. An extra section in this unit can be used to hold bulk food stuffs.



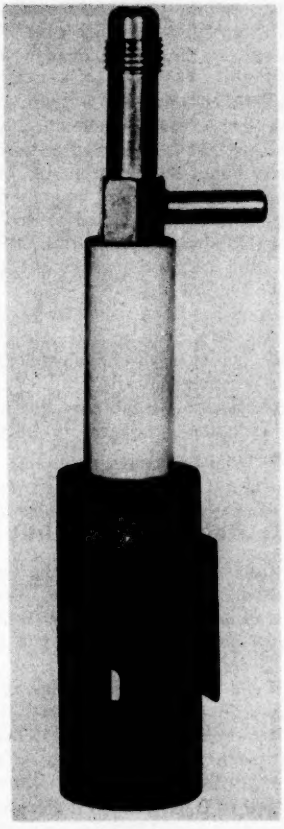
Dunhill Pizza dough retarder

The retarder is all steel with stainless steel front doors, splash and interior. Entirely insulated with high quality corkboard and back, bottom and sides of the unit are finished in extra hard Duco enamel. The work top is available with laminated board or marble or combination of both. Dimensions are 60 inches long, 30 inches deep, 34 inches working height.

For additional information, Circle No. 51 on Reader Inquiry Card.

Refrigerant Leak Detector

A NEW leak detector stem detects leaks of non-combustible halide refrigerant gases quickly and accurately, even when the leaks are as small as 20 parts of gas in a million parts of air. The detector stem employs a small acetylene flame which reacts instantly to such gases as F-11, F-12, F-21, F-113, F-114, and Carrene; or to methyl bromide vapors in air, where such concentrations are less than 10 per cent. This stem is part of two new leak detector outfits introduced by Linde Air Products Company, a Division of Union Carbide and Carbon Corporation.



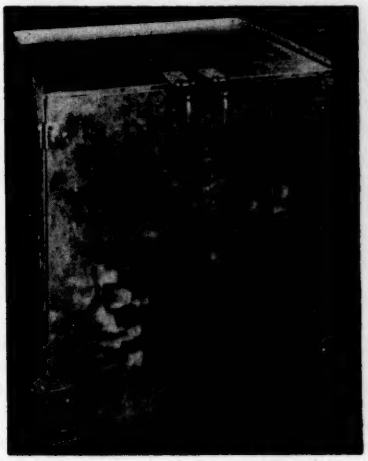
Leaks of refrigerant gas are easy to locate with the new Prest-O-Lite Halide Leak Detector Stem. Shuttered light shield sets off every variation of flame color.

A three-ft. long suction hose probes into hard-to-reach spots and draws escaping gas to the special alloy reaction plate, where any trace of refrigerant gas causes a distinct color change in the flame. Because of the sensitivity of the reaction plate and the flexibility of the suction hose, it is easy to pin-point the source of a leak rapidly. A stainless steel mixer tube and a ceramic insulating sleeve prevent overheating of the handle during operation.

For additional information, Circle No. 55 on Reader Inquiry Card.

Dairy Truck Refrigerator

A NEW dairy truck refrigerator has been introduced by Bohn, which has been manufacturing ice refrigeration equipment for almost 100 years. The new Bohn truck refrigerators offer three advantages: saving of labor, by eliminating back-and-forth handling; increase in profits, by eliminating returns of unsold products; protection quality, by assuring that products can be sold dry, cold, and at proper temperature.



New dairy truck refrigerator, single door for regular dairy trucks. The new refrigerators are available in two sizes: Model DR1, single door for regular dairy trucks; and Model DR2, double door for stand-up drive trucks.

C. Hoffberger Company, Baltimore, Md., producing the new equipment, announces that the new refrigerators have been created exclusively for the dairy industry, with practical, efficient design. They are all galvanized, rugged steel construction, with solid Temlock insulation.

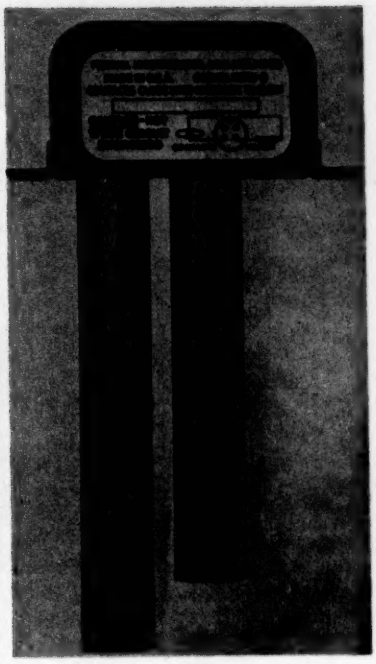
For additional information, Circle No. 54 on Reader Inquiry Card.

Flow Detecting Device

A NEW precision flow detecting instrument, called the Detect-A-Flo, designed to sense and respond to changes or stoppages in the flow of air has been developed by Fenwal Incorporated.

Originally developed to prevent high-capacity aircraft heaters from overheating if their air intakes become clogged, the Detect-A-Flo can be used as a warning device in air-cooled equipment, a ventilation control, and for similar applications where a particular flow rate must be maintained. It may also be used as a liquid-level detector or controller in storage and supply tanks. Viscous fluids, which sometimes affect the accuracy of float-type units, have little or no effect on its operation. Highly accurate level detection is obtained since the unit responds to a change of less than 0.1 inch in liquid level.

The instrument can be set to respond to any mass rate of flow of air in the approximate range of 1000 to 50,000 lb per hr. per sq. ft. This range corresponds to less than four feet to more than 180 feet per second for flows of standard air. It is inserted directly in the duct line or tank being monitored, thus eliminating lead lines, auxiliary fittings, and related condensate or clogging.



New Detect-O-Flow Unit

For additional information, Circle No. 60 on Reader Inquiry Card.

Lip Tacker for Gaskets

TACKING gaskets on refrigerator doors, commercial refrigerator boxes, beer coolers, domestic boxes, refrigerator truck bodies, etc. requires the use of a special type one-hand tacking unit. The tacker has an extended "lip" at the driving end. This extension fits over the raised surface to drive staples through flange of gasket and fastens the gasket to the refrigerator door.

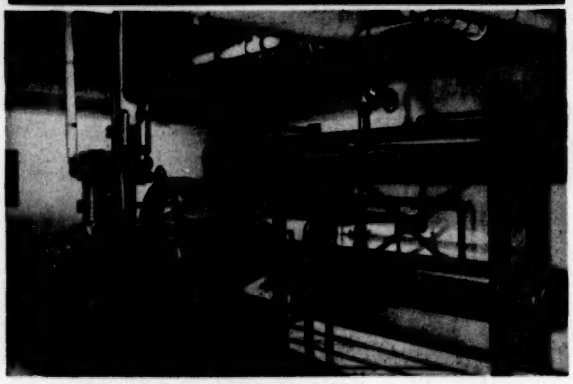
TLX-4 Hansen tacker with extended lip for tacking gaskets, etc. with raised or grooved surfaces.

A booklet illustrating and describing tacker and kit will be sent on request to the A. L. Hansen Mfg. Co., Chicago 40, Ill.

For additional information, Circle No. 59 on Reader Inquiry Card.

Prevent Profit-Eating Downtime

Here's **HOWE**



20-Ton Howe Ammonia Compressor—Veterans Hospital—San Fernando, Calif.
Distributor: Hugh Robinson & Son, Los Angeles

HOWE Standard Ammonia Compressors, to 150 tons, are built *right* from the start, thus averting costly downtime due to mechanical failure. Many users write us they have operated Howe units for 10, 15, even 25 consecutive years with surprisingly low operating costs. Efficiency from both a power and maintenance standpoint have been of prime importance for over 41 years at HOWE. For your "preventive maintenance" program, consult Howe engineers for replacement, remodeling, or an entirely new refrigeration system.

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Since 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment.

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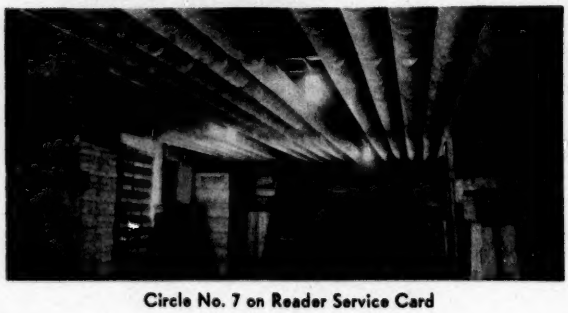

Circle No. 7 on Reader Service Card

Press Briefs

Old Refrigerators a Menace Death Traps for Children

DISCARDED refrigerators in garages, basements, and back porches have become death traps for many children this summer. Particularly attractive to them, the old refrigerators offer an inviting place to hide, but if the door ever closes behind them, it would be impossible to open it from the inside, and death from suffocation would be certain unless they were rescued in time.

News reports of August 14 stated that eleven children had been victims in two days—at Haverhill, Mass.; Richmond, Va.; Procter, Ark. Others previously had been reported from Kansas City, Mo., Chicago and other cities. Nearly 100 such tragedies have been reported during the past two years.

At Richmond, four boys, three 7 and one 5 years, were missing and while an intensive search developed, they were already dead in an airtight refrigerator in an unused hospital building only about 60 feet from the home of one of the boy's parents. The Arkansas tragedy took five children from one family, their tomb an old refrigerator, long unused, that stood on a porch of the home. At Haverhill, two boys, four and three years old were found in an abandoned ice box on a dump.

The gravity of the situation has been recognized by the Refrigeration Service Engineers Society and Air Conditioning and Refrigeration Institute who have cooperated in widely publicizing this potential hazard.

Many states have enacted laws punishable by fine and/or imprisonment for abandoning refrigerators without first removing the hardware.

Gas Company Adds Refrigeration Unit

A 1500-TON refrigeration unit will be built at the Texas Gas Corporation's gasoline plants, Winnie, Texas, at a cost of $800,000, it was announced recently. Russell M. Riggins, president, said the unit will be used to cool the natural gas to get more liquids.

The two gasoline plants at Winnie process approximately 175,000,000 cubic feet of gas a day. The water in the area is so warm that it cannot cool the gas sufficiently to extract all the liquids such as propane, butane and natural gasoline.

The contract was awarded to Gasoline Plant Construction Corporation of Houston and work already has started. When the work is completed practically all the liquid hydrocarbons will be removed and the gas will be clean and dry. The entire system there handles in excess of 200,000,000 cubic feet of gas daily which is processed and delivered to transmission lines.

Air Conditioning Requirements

AIR conditioning the average office is like giving every person in it a third of a ton of ice for each day to keep him comfortable. That's what one New York consulting engineer estimates as the normal requirement for a typical office building air conditioning system. He arrived at his figures by allowing 110 square feet of floor area per person and estimating the average amount of body heat generated by an office worker, plus the amount of heat given off by a lighting load of 2.5 watts for each square foot of floor space.

Sun Helps To Cool Pentagon

A ROOFTOP electronic sensing element which measures the heat of the sun is being used to air condition the Pentagon, Washington, D. C. The building's air conditioning system, believed to be the world's largest, provides cooling equal to the melting of 14,400 tons of ice every 24 hours to keep the occupants comfortable despite summertime temperatures which sometimes hit the high 90's.

To control the huge air conditioning system, consulting engineer Charles Leopold of Philadelphia in collaboration with Minneapolis-Honeywell engineers conceived a novel automatic system which anticipates weather changes to adjust indoor temperatures. The control system measures the degree of solar heat the year round, via the rooftop electronic devices—subtracts it from the outside shade temperature and applies the final temperature reading to the air conditioning system. The system then tempers air to the offices and public spaces.

By contrast, the engineers point out, Chicago's mammoth Merchandise Mart requires only 6,500 tons of cooling, while famed Radio City in New York needs but 9,750 tons of air conditioning.

Lily Bulb Storage Cases Lined With Plastic Film for Better Storage

LILY bulbs keep better when storage cases are lined with plastic film, reports Dr. Neil W. Stuart of the United States Department of Agriculture. Also, he says it results in stronger plants with more blooms. Bulb growers do an annual business of a little more than a million dollars. Just how much moisture should be in the peat when the bulbs are packed, depends on the plans the grower has for marketing the bulbs. For the early blooms there may be more moisture in the packing than when the plan is for long, low-temperature storage. If the peat is fairly dry (which will be about 50 percent of its total moisture capacity) it keeps most of its moisture for several months in film-lined cases. The danger is in too much moisture.

No Change in Egg Supply

THE supply of eggs for the rest of 1953 is expected to be about the same, per person, as in the last half of 1952, according to a report from the U. S. Dept. of Agriculture. Production is likely to exceed the record fall level of 1952 since the number of layers is expected to be at or above 1952 levels and the rate of lay higher. However, part of the gain in output will be offset by the reduction in storage holdings of shell eggs which were the smallest on record July 1. These supply prospects indicate that prices to farmers in the last half of 1953 will be closer to 1952 levels that was the case in the first half of 1953.

Quartermaster Buys More Frozen Foods

NEARLY 10 million pounds of frozen fruits, vegetables and juices were purchased by the Quartermaster Corps during May—a substantial rise over the 7 million pounds recorded in May of 1952.

Freezer Storage Requirements

FREEZER storage requirements by the end of 1953 will amount to 259 million gross cubic feet, which will require continuing expansion of approximately 12 million cubic feet per year, according to a study by DTA.

From Any Angle!

Easy-reading Taylor Industrial Thermometers invite frequent readings for better protection of your equipment.

For Cold Water and Brine Lines, Insulated Brine or Ammonia Lines, Condenser and Water Lines, Hot Water and Steam Lines, Ammonia Discharge Lines, Brine Tanks and Cold Storage Rooms. Wide selection of bulb and stem styles and angles. Ranges from −40° to +950°F. or equivalent Centigrade. Rattle and dust-proof cases. Three-times easier-to-read BINOC* tubing.

For insulated brine or ammonia lines
Insulated stem, straight (shown) or 90° angle. Range minus 40° to +110°F.

For cold storage rooms
Straight or 90° angle (shown). Supersensitive bulb for air and gas temperature measurement. Range minus 40° to +110°F.

For brine tanks
Oblique angle (150°) designed for easy reading below eye level. Range minus 40° to +110°F.

For small diameter brine or ammonia lines
½" fixed thread connection. Stem extends 1" below the thread. Range minus 20° to +120°F.

There's a Taylor Thermometer for practically every temperature measuring problem. Ask your Taylor Field Engineer, or write for **Catalog 30C.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

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New Orleans.....Whitman-Holloway-Olivier

MARYLAND
Baltimore.....Leidy Chemicals Corp.

MASSACHUSETTS
Boston.....A. E. Borden Co., Inc.
Fall River.....Borden & Remington Co.
Holyoke.....Eastern Chemicals, Inc.

MICHIGAN
Detroit.....Davis Supply Co.
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St. Paul.....Cherry-Burrell Corp.

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NEW JERSEY
Newark.....National Oil & Supply Co.

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IR

An Important Announcement to VIP* – Our Readers

WITH this September 1953 issue, Ice and Refrigeration greets its thousands of readers under its new title of INDUSTRIAL REFRIGERATION. It is said "that there is nothing so constant as change" and this is especially true of business and leading trade publications which disseminate current information to industries they serve.

INDUSTRIAL REFRIGERATION succeeds Ice and Refrigeration with an enviable record of 62 years' continuous publication.

Publication Established in 1891

Established in 1891 to serve a then young and aggressive industry, with promise of becoming a major factor in the economical development of the nation, the use of mechanical refrigeration was confined primarily to such principle industries as breweries, cold storage warehouses, ice manufacturing plants and meat packing establishments. The contribution which mechanical refrigeration made to the advancement of these major industries is now a matter of record.

The turn of the century witnessed great strides in the use of heavy refrigeration equipment, spurred on by the dissemination of practical and technical information which Ice and Refrigeration provided to the growing industry. A recent book, "Refrigeration in America" by Oscar Ed Anderson, Jr. (1953 University of Cincinnati), preserves for posterity a history of the technicological changes and advancements which stimulated the growth of the industry, and credits Ice and Refrigeration thusly:

> "The appearance of means for the exchange of technical information was a significant factor in the progress of mechanical refrigeration. The printed word played an important part. *Ice and Refrigeration, the first periodical in the field* began publishing in Chicago in 1891, to be followed after some years by other journals, both in the U. S. and abroad."

Only Publication Serving The Industrial Field

INDUSTRIAL REFRIGERATION is the only journal published today specifically edited to serve the industrial segment of the refrigeration industry.

The use of large tonnage refrigeration equipment, regardless of application, is basically the same. Its use in a brewery, refrigerated warehouse or food processing plant provides basic information for equally suitable application in such plants as bottling, candy manufacture, ice manufacturing, packing houses and the nearly 100 other major industries utilizing large tonnage refrigeration equipment in manufacturing processes and air conditioning.

INDUSTRIAL REFRIGERATION, building on the foundation of its predecessor publication's long years of service, is planned to provide a direct message to the executives and operating personnel whose primary concern is to make the best possible and most economical use of refrigeration and air conditioning as a necessary adjunct to their industrial processes. The name INDUSTRIAL REFRIGERATION, therefore, is fully descriptive of the place it is destined to take in the increasing consciousness and acceptance of refrigeration as indispensable to a large and growing list of industries.

Industrial Refrigeration Touches Many Fields

In this growing process, wider usage is being uncovered for refrigeration, and this in turn has called for more exact knowledge of its application and usage. As an indication of the far flung industrial refrigeration field, there are refrigerated warehouses, frozen foods processors, breweries, dairies, creameries, ice cream plants, ice manufacturers, butter and cheese processors, meat packing plants, super market refrigerated warehouses, fish freezers, poultry packers, chemical and pharmaceutical manufacturers, textile manufacturers, bakeries, candy manufacturers, factories, hospitals, hotels, ice skating rinks, consulting engineers, architects, and contractors specializing in refrigeration and air conditioning construction. Some of these are old and established, some are young with expectations of an expanding future, but they all have potentialities of an increasing use of refrigeration.

It is this role that INDUSTRIAL REFRIGERATION is well qualified to fill. It will continue its policy of keeping readers informed on what's going on in refrigeration, applicable to the entire industrial refrigeration industry.

We take this step with complete confidence that it will meet a need of the times. Fortified with that confidence, we look forward with assurance, and pledge ourselves to a conscientious striving toward upholding the reputation that has been established by so many years of continuous service.

H. L. McDermott

Editor and Publisher

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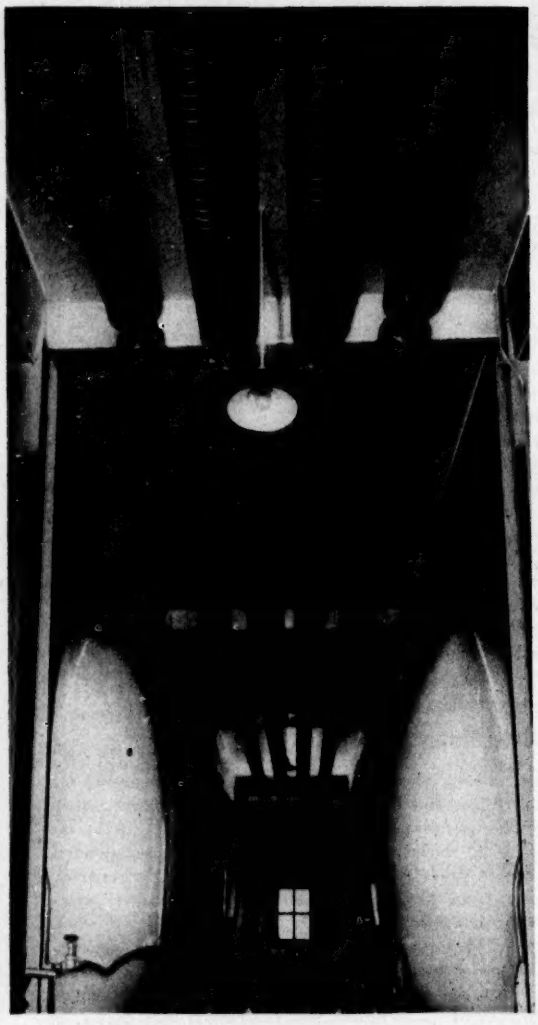
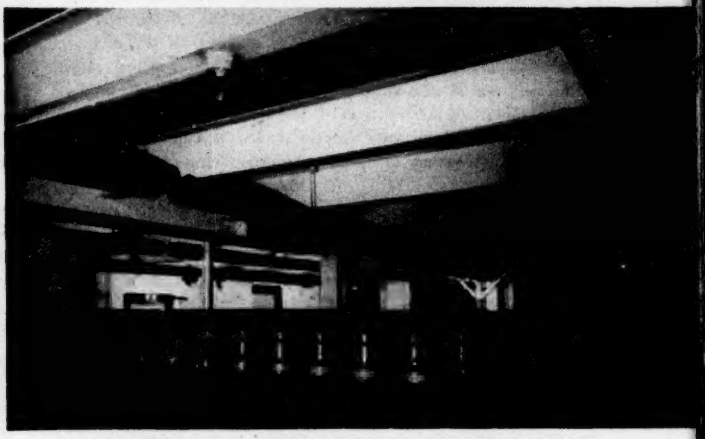
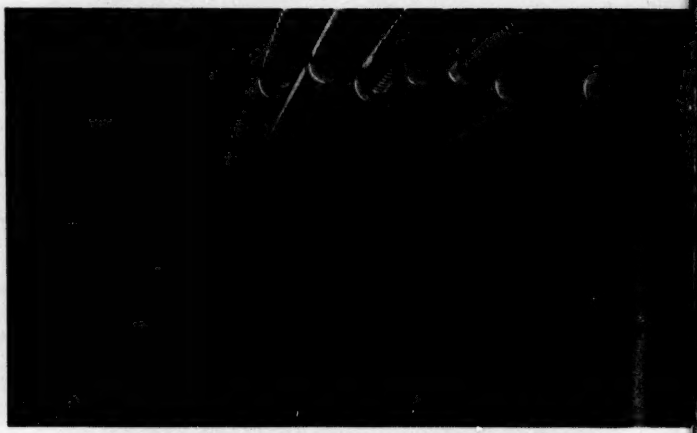


Dimco Cast Aluminum Fin Evaporators are especially ideal for brewery applications. View of a Stock Cellar at Pfeiffer Brewing Company, Detroit, Mich. Temperature 32°F

The Ideal Refrigeration Surface for Cold Storages, Freezer Plants, Dairy Products, Packing Houses, Abattoirs, Breweries and numerous applications



Keg Shipping Room—Pfeiffer Brewing Co., Detroit, Michigan. Cellars throughout the brewery also equipped with DIMCO Fin Coils.



Freezer Storage—70 ft. x 90 ft. x 11 ft. high. One of 4 floors similarly equipped with DIMCO coils. The Terminal Cold Storage & Ice Co., Dayton, Ohio.

Makes Planning Easy **... Can be Connected Together for any Desired Arrangement . . . Screwed, Flanged, or Welded. Adaptable to all Refrigerants and Dimensions**

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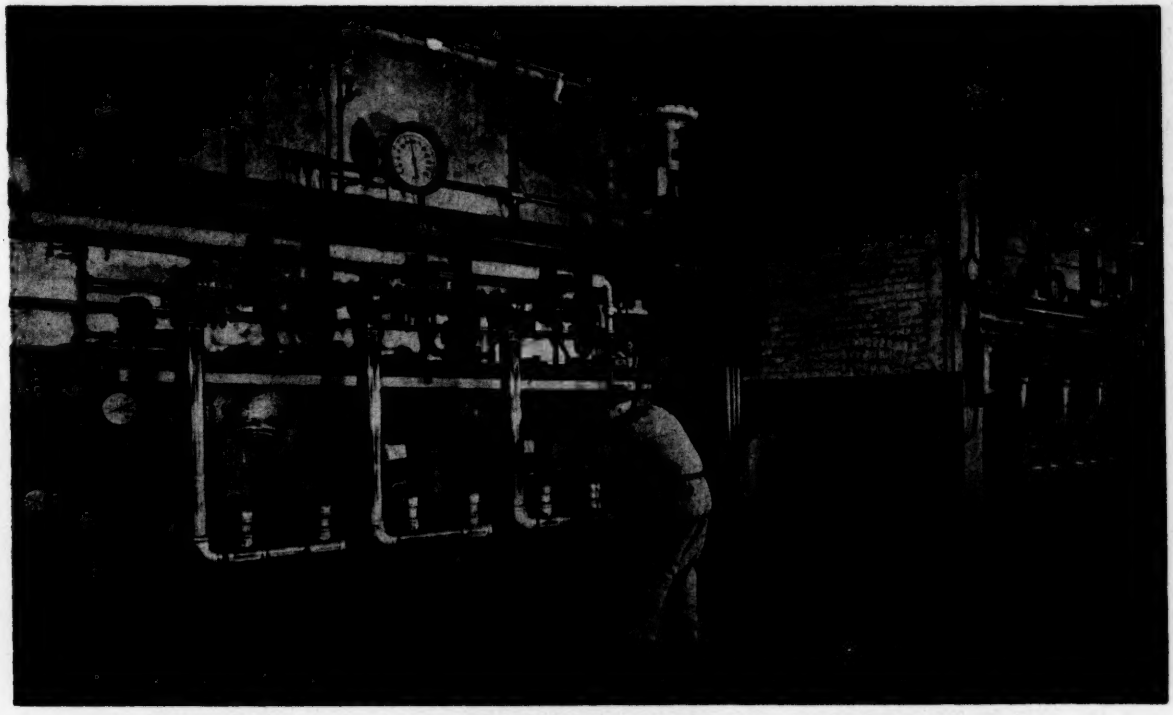


Fig. 1. Boiler room, showing gas-fired boilers equipped for fuel oil winter service.

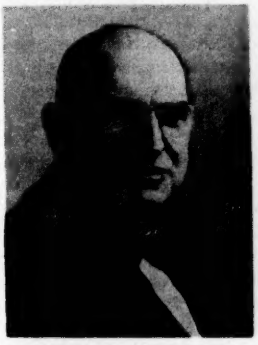
MODERN BREWERY REFRIGERATION

Although great strides have been made in practical engineering applications, author finds that present refrigeration plants leave much to be desired.

BY GEORGE B. BRIGHT
Consulting Refrigerating Engineer
Detroit, Michigan

IF the author had been privileged to select the title, he would have been inclined to title it "Practical Brewing Practices." While a strong believer in modernization, the author finds many, many things that considered modern are far from being practical, and this applies to almost every industry today. It is true we have gone a long way by the adoption of new and scientific methods in all sorts of manufacturing industries, and it probably applies to the brewing industry as much as any other. However, there is a practical limit to every one of these modern sciences that has to be considered as paramount to the successful operation of the brewery, or whatever the project may be.

Prior to prohibition there were some 1500 breweries throughout the United States — none of them very large. Breweries at that time were operated on a very secretive basis. All of the brewing technique was in the hands of the Master Brewer who knew all of the details — very much like grandmother making bread — he knew how to do it and didn't tell very many people his secrets. Each brewery had their own special secrets and it depended on where you worked as to the process followed. Breweries at that time operated the largest refrigerating machines in existence. Brewing was more or less a batch process. Brewery buildings were made many stories high, so that the materials flowed by gravity from top to bottom during the process. The same with the cellars—usually the settling cellars were at the top. The beer flowed by gravity from the settling cellar to the fermenters, from the fermenters to the chipcask, chipcask to aging tanks,



GEORGE B. BRIGHT
Detroit, Mich.

This paper was presented by George B. Bright at the 43rd annual convention of the National Association Practical Refrigerating Engineers. Mr. Bright is a consulting refrigerating engineer, heading the George B. Bright Company refrigerating engineers, and the Detroit Ice Machine Company manufacturers and contractors, Detroit, Mich.

The author is a charter member of Michigan Chapter, NAPRE, a Past President and Life Member of ASRE, a member of the Engineering Society of Detroit, and a member of the Board of Rules, Department of Buildings and Safety Engineering, city of Detroit, since 1924.

and finally to the finishing tanks. Government cellars were always across a public highway from bottling works. No bottling works were allowed to be adjacent to the brewery in those days. The beer for sale was usually put into tanks, and the tanks locked so that no additional beer could be put in, and it was delivered either to the racking or bottling plants from these locked tanks.

Steam Operation

Most breweries operated completely with steam, from their own steam plants. Very little electrical equipment was used. In fact, all machinery was driven from steam engines, with exception of a few electric pumps, and in many cases these were even belt-driven.

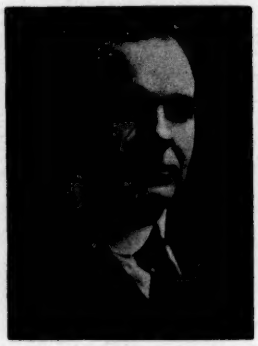
Wort cooling was almost entirely handled with the Baudelot type cooler, using water in the upper section, direct expansion ammonia in the lower section. Some breweries contained kuhlschiffs, which were large shallow tanks, in order to expose the wort to the atmosphere, thereby taking advantage of atmospheric cooling before attempting to pass it over the Baudelot cooler.

Most beers and ales in those days were produced almost entirely from malt. Only shortly before repeal was the use of adjuncts adopted, mostly rice. Many breweries installed rice cookers just prior to repeal. Hops, as a rule, were imported from foreign countries, and only a small percentage of local hops was used in the brewing process.

Most breweries had separate refrigerating machines of large capacity for the wort cooling, which was done usually in a two to three hour period and put a tremendous load on the refrigerating system. In some instances the machines were equipped with double suction and were handled in this manner: the storage cellars were piped very light, and continued heavy defrosting necessitated running the suction pressure as low as 10 to 15 lbs., thereby requiring very large refrigerating machines in order to produce the desired refrigeration. Some cellars contained little or no insulation. The designers felt that the good old American air space in a wall of a brewery cellar was all that was needed. However, in later years with the introduction of corkboard, many breweries did insulate their outside walls.

Repeal of Prohibition

During prohibition the steam-driven refrigerating machine became almost entirely extinct with the passing of beer making. This was due primarily to the developments in central station power which offered comparable, if not cheaper, costs for producing refrigeration with electric-driven refrigerating machines. Therefore, after prohibition and the return of the brewing industry, there weren't any large refrigerating machines available. Most of those manufacturers had gone out of business and disposed of their patterns, so that the brewing industry was offered a series of small electric-driven constant speed machines, with exception of a few makes which were entirely new to the trade at that time. As a result, the brewery which started in operation after prohibition didn't have a very efficient machine. If they wanted to operate with steam, they had to use rather small high speed compressors operated with uniflow engines, and they were rather expensive compared with the larger machines installed prior to prohibition.



CHARLES GILBERT, Detroit, Mich.
Chief Engineer
Pfeiffer Brewing Co., Detroit, Mich.

New Developments

Since repeal, however, there have been many, many new and interesting developments in the brewing industry. In the first place, there are considerably less breweries. The large breweries have become larger and the small ones have closed up. There are some breweries today making 5,000,000 barrels of beer annually. There are many new developments with the handling of materials, clear through to the delivery of the product after it is finished. A few of these are such things as pneumatic conveying systems for handling brewing materials: cereal cookers; mash mixers; and, lauter tubs with percolator kettles for utilizing steam, giving a more rapid boiling in place of the previous jacketed bottom in most of the older style brew kettles.

Wort cooling has been improved to a great extent by passing the wort through automatic hop strainers rather than the conventional hop jack, and over open type coolers and, in some instances, closed type coolers; and the cooling water in most cases is treated and used for the next brew. There is a decided improvement in the filtering equipment, including powdered filters and activated carbon filters. Various chemicals are in use today, not heretofore thought of.

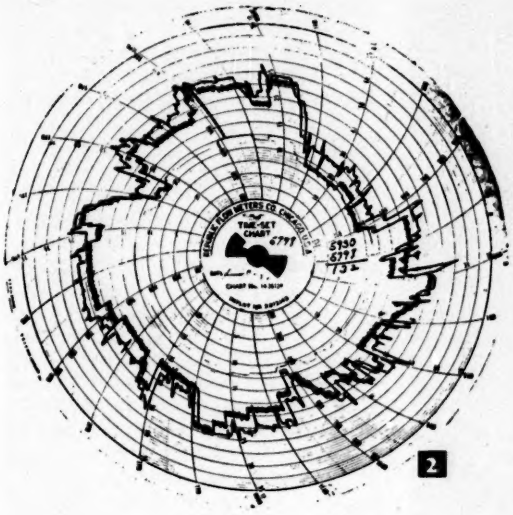
Particular attention has been given to the maintenance of clean air conditions with the aid of electric precipitron air cleaners and sterilamps. In some instances ammonia has been substituted for cooling the attemperator systems in lieu of brine or sweet water. All beer is handled through beer meters rather than calibrated tanks. CO_2 is collected and stored in liquid form, and in many cases carbonation is prevalent in place of the kraeusening system.

There have been many innovations in the way of pumping and handling of the finished product through the racking and bottling departments. The latter contains automatic case unloaders, automatic case loading, and in most cases all of the bottled or canned beer is in paper cartons rather than the conventional wooden case. Steel beer barrels are replacing the conventional wooden type beer barrel, and in some cases stainless steel which do not require pitching.

Many breweries generate only sufficient steam for their process and purchase outside electrical power from central stations. However, everything that can be driven electrically in the modern brewery today is an electric operating device. This has worked out fine to the advantage of all except the refrigerating machine which, when electric driven, is at a constant speed—with the result that there must be some means of accommodating a varying load.

Practical Brewery Operation

Data and information presented here is on Pfeiffer Brewing Co., which prior to prohibition, produced about 120,000 barrels of beer per year and was one of the conventional small breweries in the United States. The author has had the pleasure of engineering this plant since its beginning, and believes it to be a fairly representative brewery. It has grown from a little over 300,000 barrels in 1935 to 1,650,000 barrels in 1950. The brewery proper occupies



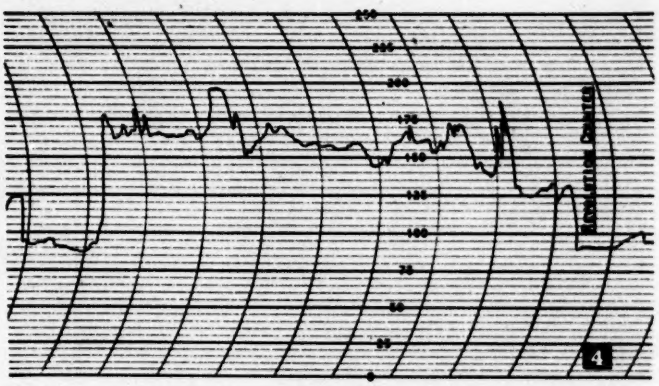


Fig. 4. (Above) Recording shows various speeds of large size refrigerating unit, caused by variation in cellar load.

Fig. 2. (Left) Steam flow—air flow chart. Steam flow is read on scale 0.70, in thousands of pounds per hour.

one city block split in the middle by a belt line railroad. There is one brewery cellar approximately 95 ft. square directly across the street from the present brewery. The executive offices also occupy additional space across another street.

This particular brewery produces only bottled beer. All of the draught beer, amounting to approximately 15 percent of their sales, is made in a brewery at Flint, Mich., so that the operation here is rather unique in that respect.

This brewery was started with a very small amount of capital and had as its original plant equipment one 135-bbl. kettle, and one 185 bbl. kettle, with respective mash tubs. It had an antiquated boiler plant including several old style (very old) steam-driven refrigerating machines. Today it is considered one of the most modernly equipped breweries and owners and operators of breweries all over the country come to see many of the new developments that have been pioneered by this particular organization.

Steam for Processing

This brewery utilizes steam only for processing—that is, for heating and manufacture of beer. All power of every description is purchased from a public utility and they enjoy a fairly low operating cost which compares with the best at a very small investment as far as power plant is concerned. The boiler plant is operated on natural gas in the summer months, and supplied with fuel oil for the winter months when natural gas is not available. The actual cost of fuel oil itself is greater than cost of coal. However, it is believed that there is a decided saving in the overall cost in this method of operation when the labor in handling of coal and ashes is considered.

Fig. 1 shows the front view of a four-drum sterling boiler. There are two of these boilers, each boiler approximately 8,650 sq. ft. of heating surface, and about 550 sq. ft. of water walls. The nominal rating of each boiler was supposed to be about 860 hp. The furnace volumes have been increased so that it is possible to get a much higher rating with peaks hitting as high as 60,000 lbs. One boiler is used at a time for operating the brewery, and steam is used for process and heating only.

Gas and Oil Burners

Each boiler is equipped with three combination gas and oil burners and, as a rule, the boiler utilizes natural gas from April until late in the fall. The gas rate is considerably higher now than it was when the installation was made, the average rate being about $0.045 per therm—which is 100,000 Btu's, or approximately 100 cubic feet of gas. The evaporation with gas is approximately 1,000 lbs. of steam for 1,300 cu. ft. of gas. In the winter, when using fuel oil—No. 6 Bunker C—we get an evaporation of 14 and 15 to 1; that is, 14 or 15 lbs. of steam to 1 lb. of oil. The fuel oil cost in Detroit at the present time runs anywhere from 6½ to 9½ cents delivered in the fuel oil tanks on the brewery property.

Steam pressure is 150 lbs. High pressure steam is used for cooker and mashing, and is reduced for all other process work through a series of reducing stations. As an illustration, the grains dryer is carried at 90 lbs.; the exhaust being dumped into the heating main for further expansion. The pasteurization and heating of water in the bottling department is about 6 lbs. The steam on the percolators of the brew kettles and coils in 35 lbs. All heating units are on 6 lbs.

Steam Accumulator

There is a steam accumulator which adds very materially to the economical operation and uniform load, since all the firing is done by hand. The steam rate is set for a particular period—it might be an hour or two. When there is a demand for steam for a short period at high pressure, the steam valve automatically closes off feed to the accumulator, and the low pressure steam is evaporated from the accumulator during this period, thereby levelling out the demand for oil or gas, giving more efficient operation. A recording chart (Fig. 2) shows the steam flow—air flow. It is rather interesting how the steam demand varies throughout the 24 hour period, but the operator is able to set his controls for whatever the demand may be. In this particular chart, it may be noted that the steam flow at one point got as low as 13,000 lbs. per hour for a short period. Then again, it went as high as 50,000 lbs. With the steam accumulator there is an advantage of some leveling out the variation in load, which is very necessary with the process and heating steam in any brewery. The outer, steadier line is steam flow read on the range 0-70, which is thousands of lbs. per hour. Air flow cannot actually be measured on this chart as there is no scale for it, but it will be noted that the operator keeps the air flow proportionately close to steam flow at all times with the help of a draft guage.

All condensate returns are brought

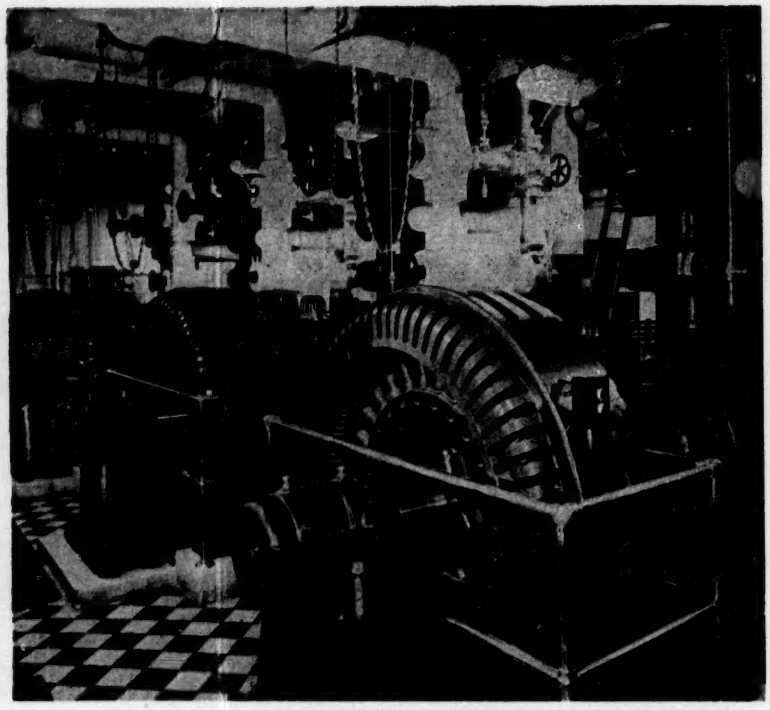


Fig. 3. Compressor room; view of four dual effect synchronous motor driven compressors.

back through a deaerating type heater, and all water is treated with a special boiler treatment, so that the turbining of tubes is unnecessary in this particular plant with the present operation. Air for combustion is supplied by forced-draft variable speed blower driven by steam turbine. The turbine operates automatically according to the load. When the load is light, there is a throttling action on the turbine which causes the blower to deliver much less air. The operation is controlled by a comparative steam flow—air flow regulator which works in conjunction with the air requirement.

Furnace Lining

The furnaces are lined with suspended refractories so damage to any part of the interior of the furnace can be repaired easily by removing these suspended refractories. At the present time there is very little expense in the upkeep of the furnaces. One boiler usually stays on the line for about six months at a time.

Fig. 3, a view of ammonia compressors, shows four 12 x 12 twin cylinder, single acting, dual effect compressors operating at 257 rpm. In addition to these, there are a 4-cyl. 12 x 12 simple compressor, a 4 cyl. 14 x 12 simple compressor and two 9 x 9's operated with a motor between. Compressors are Frick manufacture. At the present time, the 14 x 12 compressor, operating at 240 rpm, takes care of the cellar load at approximately 20 lbs. suction pressure. All attemperators for fermenting—in open and closed fermenters—being of ammonia flooded type, are operated on a 30 lb. back pressure on the simple side of the dual effect machines. The wort cooling is done at 55 lbs. on the dual effect compressors. At no time (except under severe conditions) have more than three of these dual effect compressors been operating at one time. One 12 x 12, two 9 x 9's and a 4-cyl. 12 x 12 are standbys at all times. There is a relief valve between the 55 lb. and 30 lb. suction, also between the 30 lb. and 20 lb. suction, should there be any excessive load on the higher pressure suction.

Table No. 1 shows various suction pressures from 15.7 lbs. to 55 lbs., with the corresponding temperature, horsepower per ton, and the theoretical discharge temperature. Note the enormous saving in power for a ton of refrigeration as shown on the third line, when operating with 55 lbs. suction pressure as compared with 15 lbs.

Electric Power

All refrigeration machinery is driven by electric power, with exception of one 4-cylinder 12 x 12 compressor which is driven by a direct-connected uniflow engine. This is only used in the winter time when the load is very light. It is equipped with a pressure control enabling it to operate down to a very low load. Refrigeration—for cellar cooling, attemperator cooling, beer cooling, wort cooling and liquifying of CO_2, is done with ammonia, in every case using the flooded system. There isn't a single expansion valve in the plant (with the exception of a little one that cools a small amount of water for the Yeast Culture Room).

Fig. 4 shows the recorded speed of the 4-cylinder 12 x 12 compressor operated on the cellar load, and indicates the variation of cellar load caused by opening doors, hot wash water on the floors, and other items. This is a fairly good size machine. Note that the speed dropped down from 180 revolutions to about 90 revolutions at one point. This was due to the fact that the washing and adding of beer had been discontinued. The normal speed when there were no activities in the cellar would ordinarily be somewhere around 80 to 90 revolutions. But at times this machine will run as high as 200 rpm. The chart indicates the necessity of coping with a variable load for cellar operation, and is a factor that has not been licked with the direct-connected synchronous motor jobs, except by the addition of clearance pockets or some unloading device.

There are six Detroit Ice Machine Company evaporative condensers for this refrigeration plant. They are made up with 5½ inch diameter fins on 1½ pipe, 4 pipes high, with stainless steel housings, and direct-driven enclosed-motor fans having monel metal frame and wheels, (See Fig. 5). These condensers are located on the roof of the bottle shop, each in

TABLE 1: SHOWING SUCTION PRESSURE — TEMPERATURE TO HP RELATIONSHIP.

	Various Operating Pressures				
Suction Pressure, psig	15.7	19.6	30	45	55
Suction Temperature	0F	5F	16.6F	30F	37.5F
H.P. Per Ton	1.40	1.30	1.025	.77	.64
Discharge Temperature	220F	210F	190F	160F	150F

The above approximate figures are based on ASRE condensing temperature of 86F and 154.6 psig.

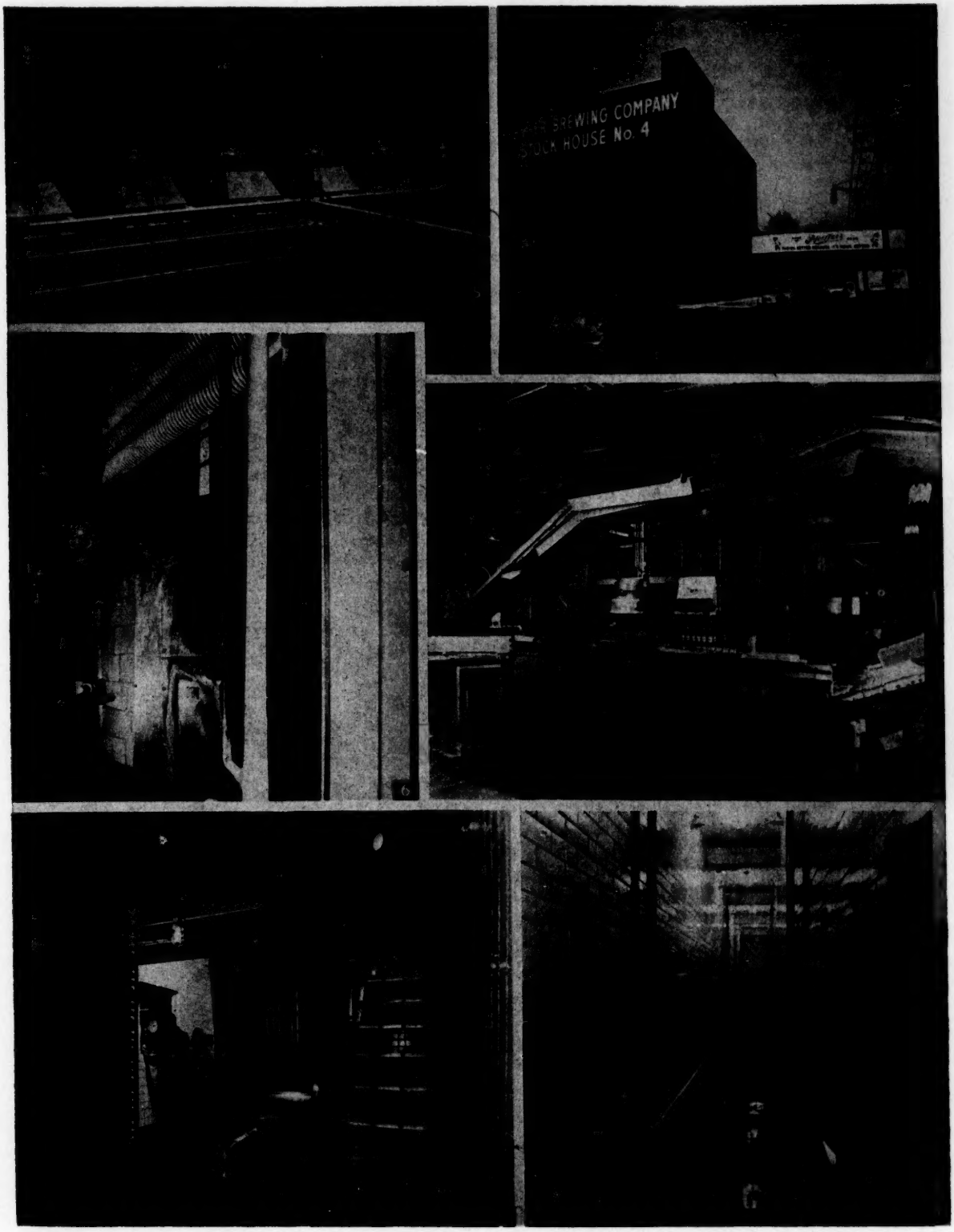


Fig. 5. Evaporative condensers on bottling plant roof.

Fig. 6. Plenumizer and fin evaporators in fermenting cellars.

Fig. 7. Wort Coolers. Half of each plate cooled by sweet water; other half by direct expansion NH_3.

Fig. 8. Exterior view of stock cellar, malt silos, and bridge and pipe span between old and new buildings.

Fig. 9. Case unloader. Automatically unloads two cases at a time and feeds bottles to washer.

Fig. 10. Interior of a stock cellar. Aisle space between 10 tanks.

a concrete basin lined with lead. The spray water is returned to a surge tank on the second floor of the bottle shop. The water is pumped in series through shell and tube condensers, and then back to the evaporative condensers. In this way, all of the spray water first passes through the shell and tube condensers and again used in conjunction with these evaporative condensers, thereby getting double advantage with a single pumping of the water. Some heat is added by the shell and tube condensers. All gas passes through the evaporative condensers first, and then down through the liquor line to the shell and tube condensers, which gives a slight reduction in condensing pressure over the straight evaporative type.

Another refrigeration application is shown in Fig. 6, view taken inside of one of the fermenting cellars. At the top, a section of DIMCO cast aluminum finned evaporator, which is used throughout this brewery for the distribution of refrigeration. All cellars are equipped with a series of these evaporators operated on a flooded system, one accumulator for each cellar, thereby minimizing the liquid control for the system.

Defrosting

Defrosting of these evaporators is accomplished in two ways: In some cellars, where the installation of surface is at a minimum, it is done by applying hot gas to the top pipe and throttling the liquid on the outlet so as to maintain a condensing pressure in the coil itself. In this way the frost drops off very rapidly—within a few minutes time; another method of defrosting is simply by shutting off the coil and allowing it to warm up, defrosting without adding heat. This is done in some of the stock cellars and the later installations where sufficient surface was installed to allow some of the evaporators to be out of operation all the time. This particular system is preferable to the hot gas.

The Plenumizer shown in this picture was designed by the author and manufactured by Detroit Ice Machine Company (patents applied for), and is typical throughout this particular plant. All of the open fermenting cellars are equipped with these plenumizers in order to eliminate the foul gases which are prevalent in all open fermenters, due to the CO_2 accumulation. This particular apparatus is made up with a series of thin copper plates placed on ⅜ inch centers. The incoming air which is necessary to absorb the CO_2 (being about 300 cu. ft. per pound) passes between every other plate in an opposite direction to the exhaust air going out. There is an exchange of temperatures in the incoming air to the outgoing air by as much as 30 degrees on a hot day. Considerable moisture is also taken out of the air. The air is then further cooled by passing over a direct expansion or flooded ammonia coil, and is discharged through the grille at the front into the cellar. This air being slightly colder than the cellar itself, allows picking up of any surplus moisture so that the walls and ceilings are dry at all times. That is the purpose of the plenumizers. They keep the cellar under a slight pressure, because more fresh air is brought in than foul air is exhausted—hence the name "Plenumizer."

An unusual survey of modern brewery refrigeration practice is given in this article, with special reference to the practical side. The Pfeiffer Brewing plant, Detroit, Mich. has been completely rebuilt. Based on his firsthand knowledge of this project, Mr. Bright has written a detailed review of brewing during the days before prohibition, followed by a description of brewing processes and practices of today.

Wort Coolers

There are three sets of Mojonnier plate-type wort coolers in this particular plant. Two of them are used at all times. (Fig 7 shows only two). One can be cleaned while the other two are in operation . . . the rate of cooling varies from 250 to 375 bbls. per hour, depending on the requirement for the season. All steel work, pans and coolers proper are stainless steel. The room itself is lined with a ceramic tile walls and ceiling, and quarry tile floor, making the same as sanitary as possible.

The wort coolers, being of the plate type, are on hinged brackets at the rear and can be opened up for thorough cleaning. The wort flows over the top sections, which are water cooled by treated water used for brewing purposes. The bottom part of the wort cooler is refrigerated with ammonia by flooded operation. The wort, after being first cooled by the water section, is further cooled by ammonia in these bottom plates to about 50F.

Water for cooling wort is city water, obtained from Lake St. Clair, and contains certain chemicals. It is necessary to treat the water before it is used for brewing purposes. This is done by passing it through activated carbon filters on the way to the wort cooler. Then, sufficient water is put through the water section of these coolers until it is brought up to a temperature of approximately 105F. This water is collected in suitable tanks for foundation water, bottle shop, and other wash room purposes. A portion of the water is taken off and passes through a heat exchanger running opposite, or counterflow, to the hot wort coming to the cooler through a series of paraflow plates. This water is heated to 170F for sparge purposes. A definite quantity of this water is taken off in direct proportion to the amount required for brewing purposes. Thus, practically all water heating, with exception of final heating of the feed water for the boilers, is done by reclaiming the heat from the hot wort—which accounts for the small amount of steam required.

Air Purification

Air for aerating the wort is brought in through a series of blowers for each cooler, and discharges on the water section only where it comes in contact with the hot wort. Almost since the beginning of brewery operations, the breweries have depended a great deal on this type of aerating in order to give proper propagation to the yeast. This particular air in each case is filtered first through an electric precipitron filter, and is sterilized with sterilamps on the discharge side of each unit. Nothing but pure air is passed into the wort cooler room itself. The rooms are under a slight pressure, so that the excess air with vapors from the wort pass through vents in the ceiling, which is of cove construction in order to eliminate the collection of moisture.

Purification of this air with filters and sterilization is, in the writer's opinion, a very important item. It has been observed through laboratory tests that, where air is brought in through the system, even through the filters without the addition of sterilamps, considerable bacterial growth takes place when samples were placed in an incubator. Where the sterilamps were used, there was no propagation whatsoever. It would indicate then that there is a great deal of foreign matter in all air, especially in the cities where

breweries are usually located. Sterilization of the air for proper aerating of the wort is an important item in the brewing process.

An exterior view of the latest stock cellar built for the brewery is shown in Fig. 8. It is connected to the main brewery by a bridge across the street. This stock cellar is arranged for an addition, to the left. The front portion, to the right where the windows are in place, contains stairway, elevators, pumps, beer coolers, air conditioning system, etc. This building is arranged with five tanks parallel in a row, two rows wide and five tiers high. Each tank holds approximately 1000 barrels. The upper three tiers are used as closed fermenters, and the lower two tiers are used for ruh or storage.

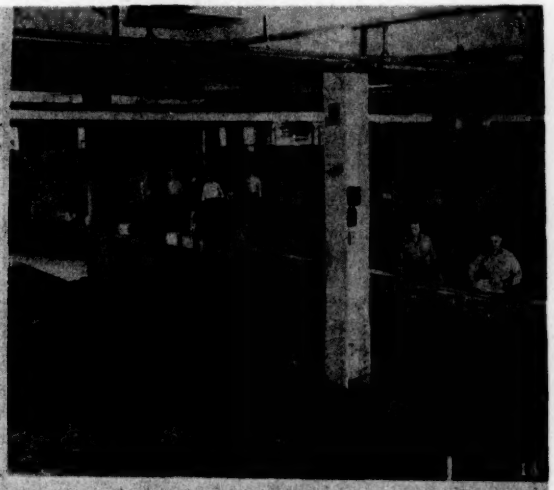
Cellar Insulation

The exterior walls on the two streets are pressed brick. On the remaining walls, they are ordinary common brick. These brick walls are constructed solid, approximately 13 inches thick, and were thoroughly waterproofed on the inside with an asphalt emulsion in order to prevent moisture from penetrating. A separate blazed tile wall was constructed 10 inches away from the brick wall and the interior space filled with granular styrofoam, Dow Chemical's new insulation material. The roof slab was insulated with six inches of corkboard.

There is quite a story in regard to the construction of this particular cellar. In the first place, preparation of plans was started on January 3, 1950, and an order for the necessary steel placed at an early date. A railroad strike came up which delayed our steel shipment considerably. However, the first beer, 30,000 bbls., was put in this particular cellar on July 9 of the same year, and the upper part, or fermenting cellars, was used throughout the balance of the year. The storage, or the two lower tiers of tanks, was not used until later in the fall. Another very important point is that the cost of this cellar, including bridge, elevator, stairs, all refrigeration, and other costs of every description, was about $21.00 per barrel of capacity. This is considerably less than other methods of installations using glass-lined tanks.

Accumulators

The projected walls at the top of the building house accumulators for the upper floors. The accumulator at the left is connected to the attemperator system and is of sufficient capacity to take care of the additional attemperators to be installed at a future date. The other accumulator takes care of the cooling of the fermenting cellar proper on the south side. There is a similar arrangement of these accumulators on the north side to take care of the attemperators and the cooling of the fermenting cellars proper. The two lower tiers of storage tanks are



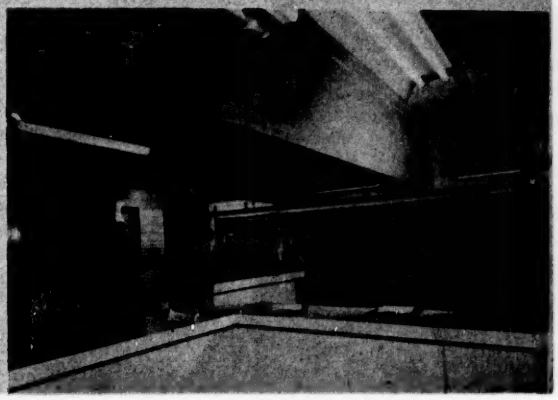


Fig. 11. Labeling and packing units, with pasteurizers in the background.

Fig. 12. Exterior of case warehouse, bottling plants, and shipping dock.

Fig. 13. Telescope conveyors for loading and unloading trucks.

Fig. 14. Precount case loading center. Remote electric eye supervises case delivery to loading dock.

on a separate accumulator system for each north and south side, so as to maintain different temperatures in these cellars. There is also an accumulator for operating a double pipe beer cooler on the second floor, which is independent of the rest of the cellar cooling. A separate cooling system is provided for a central air conditioning system or refrigerating the aisles of the present cellar as well as the proposed addition. The ammonia connections proper, including suction, liquid, hot gas and pumpout lines, are sufficient to take care of the future expansion and are all in place on top of the roof ready for extension to the new building when it is constructed. These lines, incidentally, run independently across the bridge to a series of headers for distribution to the various refrigerating systems. Each stock cellar, or building, has separate lines running to headers in the room adjoining the engine room, so that any building can be isolated in case of a leak without interfering with operation of others. Headers with valves are on all liquid, suction and pumpout lines.

Malt Silos

To the right, across the street from the new stock-house, are two malt silos equipped with recovery separators at the top. Here, the malt is unloaded over the top of the main brewery building into these silos—which incidentally, hold 14 carloads of malt. The malt is recovered by a separate pneumatic system from the bottom of the silos, with discharge into a hopper placed in the top of one silo. The malt is carried from this hopper by means of a screw conveyor to several malt mills for crushing, which mills are located in the top floor of the brew house. After being ground, it is delivered to the respective meal hoppers by screw conveyors ready for placing in the various mashing machines. The grits used are unloaded with a pneumatic system from railroad cars and carried across the top of the brewery building proper to steel storage bins extending from the first floor of the brew house to the top and which were originally used for malt storage. These bins are equipped with bucket elevators and screw conveyors discharging to the meal hoppers adjacent to the cookers, and is independent of the malt system.

Cellar Operations

Fig. 10 shows an aisle in the stock cellar between a series of tanks. As noted previously, there are five on each side. Access to the tanks is through the stainless steel chutes, or manways, to the raised manholes on the tanks behind. There is a lighting system for each tank; also a tell-tale gauge for each two tanks, as indicated on the walls. The interior finish of this particular aisle is ceramic tile walls and ceiling, and quarry tile floor. Air for cooling is supplied with a central plenumizer, so that pure fresh air is brought into this section of the building and cooled. When it is necessary to open a tank, there is a vent system which exhausts the air directly to the outside, and only fresh, pure air goes into the tank proper. This is very necessary for the closed type fermenter.

Transfer of Beer

Beer is transferred in and out of the tanks through a series of hoses, as noted on the floor. There are no lines of any description passing through the exterior walls of the cellar. At the right, there are a series of headers and cocks that permit the transfer of the beer without going behind the tanks. Fittings and connections are all chrome-plated; in fact, everything in view in these particular rooms is either stainless steel or chrome-plated. This arrangement is typical of all five floors.

Wort, after leaving the wort cooler, is first passed into settling tanks in the main building. Then, after the yeast is added, it is brought over the bridge to one of the fermenting tanks. Gas from fermentation is collected for liquefying, through the regular CO_2 collecting system. After proper fermentation, the temperature of the beer is reduced to about 44F by use of an ammonia cooled attemperator in each tank, operated on flooded system from the accumulator on the roof. This cooling is accomplished in 26 to 30 hours. There is one ring of four inch od stainless steel coil in each fermenting tank, and requires slightly longer to cool than where double rings, and sometimes four rings are installed in other parts of the brewery. Most of the yeast is collected in the bottom of the fermenting tanks. The beer is then removed through a series of double pipe coolers and passes into either of the ruh tanks.

The double pipe coolers are operated with a flooded accumulator, and a back pressure valve in order to regulate the temperature. All beer cooling throughout this particular brewery is accomplished in the same manner. Each cooler has its own respective accumulator with a back pressure valve so that the temperature can be controlled. When the cooling is completed, the system is shut off with an electric switch controlling a solenoid valve on the liquor line and on the outlet from that particular cooler. Thereby, no further refrigeration is accomplished. In case of hot water entering the cooler, the pressure is relieved through a pop valve and piping around the shutoff valve.

Case Unloading

The original, and first installation of case unloaders anywhere in the United States was made in this plant (Fig. 9). There is one unloader like this for each bottling unit, there being 10 units in this particular plant. Here, the bottles are taken from the cases automatically and distributed to the bottle washer without being touched by the human hands. The empty carton, shown at the right, is carried by conveyor through to the inspection department where suitable fillers are added; or, if necessary, the carton is removed and a new one placed before passing on to the opposite end of the building for loading with full bottles.

Fig. 11 is a view of the labeling machines and case packers used throughout. Picture shows four units in the bottle shop annex. There are six more units in the main bottle shop. This plant has bottled as high as 126,000 cases in a 24 hour period. Here, again, the case packer eliminates the handling of bottles by hand. Twenty-four bottles are dropped into a paper carton as indicated, by the mere pressing of a button. The units are all operated by air. The operator slides the empty carton under the unit, touches a button and the bottles are dropped in. They are then closed by the assistant.

Case Warehouse

An exterior view of the Case warehouses is pictured in Fig. 12. There are two, each approximately 90 by 155 ft. The building to the left is a three-story affair—the first floor used entirely for filled cases; the second floor for inspection and grain drying equipment; and the third floor entirely for carton storage. The four-story building to the right contains a basement for the storage of empty returns; the first floor is for full cases; the second floor contains "no-deposit" bottles and cans; the third floor is the bottle shop annex; and the fourth floor is used for carton assembly for the entire plant. Note the 14 trucks loading and unloading at the same time.

TABLE 2: SHOWING POWER AND PRODUCTION — PFEIFFER BREWING COMPANY — 1950 USAGE

Detroit	Production In Barrels	Steam Lbs.	Electricity kwh	Electricity Cost	Gas Cubic Feet	Gas Cost	Oil Gals.	Oil Cost	Water Cubic Feet	Water Cost
JANUARY	85,423	21,070,000	411,990	$5,753.58	34,571,200	$14,539.33	3,074	$ 199.81	6,556,800	$4,993.80
FEBRUARY	94,358	22,730,000	444,450	6,067.54	22,825,000	12,122.43	.....	.....	3,658,000	2,819.46
MARCH	106,617	24,400,000	453,600	6,208.44	26,856,300	11,350.05	3,270	212.55	5,713,000	4,360.71
APRIL	100,488	21,580,000	442,620	6,365.78	29,636,800	12,497.90	.....	.....	4,235,000	3,252.21
MAY	129,876	23,490,000	526,020	6,998.18	25,267,400	10,635.39	.....	.....	5,024,200	3,844.47
JUNE	137,017	23,810,000	716,260	9,120.67	31,047,800	13,295.72	.....	.....	7,050,200	5,366.75
JULY	160,858	24,822,000	877,380	10,782.59	30,834,700	13,270.28	.....	.....	8,418,100	6,390.77
AUGUST	166,705	26,283,000	950,940	11,621.24	37,270,900	15,927.26	.....	.....	9,414,100	7,136.87
SEPTEMBER	107,284	19,099,000	891,060	11,192.31	26,530,700	11,227.84	.....	.....	8,624,500	6,545.09
OCTOBER	105,000	21,056,000	703,560	9,335.52	28,016,600	11,773.65	.....	.....	5,650,100	4,313.87
NOVEMBER	126,321	26,639,000	669,660	8,615.97	31,128,400	12,975.93	.....	.....	6,594,000	5,021.74
DECEMBER	101,719	25,264,000	521,040	7,103.69	33,638,900	13,846.27	54,119	3,828.95	5,625,100	4,295.35
Annual Totals	1,421,666	282,013,000	7,608,580	$99,165.51	357,624,700	$153,462.05	60,463	$4,241.31	76,563,100	$58,341.09

Because of a rather unique conveyor and unloading system used, the trucks come in (and back in) with their load of empties and stay in the same position until they are fully loaded, regardless of what kind or quantity of beer they are going to take out.

Double Conveyor

As will be observed, the double conveyor arrangement in the foreground of Fig. 13 is the rear end of a telescope conveyor which passes into a truck as far as 25 ft., for loading and unloading within the truck. All the operator does, is put the empties on the conveyor at the rear of the truck, press a button, and pass the conveyor along as he continues to unload. When he gets to the front end of his truck, a push on a button stops the conveyor. Cases are passed into the lower section of the bottle shop or case warehouse, as may be desired. After unloading, full cases are placed on the conveyor—it being set in a reverse position—and are delivered to the waiting truck practically without any human handling or carrying. Claims are made that a 700 case truck may be unloaded and loaded again in approximately 20 minutes time, a considerable time saving in shipping facilities in any plant.

Further, on loading, here in Fig. 14 is what may be called a precount panel. The desired number of cases for the load is set on each machine by pressing buttons, similar to an adding machine; whatever number of cases are desired, pass through an electric eye. When the proper number pass, the machine shuts off and no further delivery can be accomplished. This, in itself, is a very great saving and was the original installation of this type of equipment in a brewery operation.

Table 2 shows quantities and costs of utilities required in connection with production in 1950 for the brewery just discussed.

Safety Plan Pays Off For Ice Company

R. F. BUTLER
Richmond Ice Co.
Richmond, Va.

OUR accident rate in our plant has always been moderate or very low, but several years ago our automotive accident rate became very alarming and we formulated a plan which did produce results.

We set up a program of paying all route men and chauffeurs a $20 bonus per year if they had no accidents. This was payable about the middle of December so that the money would be available for their Christmas needs. This program was based on the $5.00 for each quarter period and should a man have an accident in any quarter and it was proven beyond doubt that he was solely to blame, he was penalized the $5.00 in the quarter in which it occurred.

We have held a few group meetings on safety, but our experience has taught us that since we only have about forty drivers, our safety message could best be gotten over to them by talking to each individually. Our general office happens to be so situated that we have an opportunity to contact each of our men every day and we are constantly keeping them mindful of their safety record.

Our city has a Safety Council and we report to them monthly all accidents showing the approximate amount of property damage and man-hours lost from any personal injury. This organization gets out a bulletin each month listing the names of all firms contributing to this organization who have gone the entire month without accident. We post these reports faithfully on our bulletin board with encouraging remarks. At the end of each year we furnish this organization a list of all employees who have had no accidents and they in turn issue safety certificates about the size of a calling card signed by them and countersigned by us. These are presented to the men and those who do receive them are very proud to carry one of these cards. The Council also gets out several large posters each month.

Chill-Vac Process Speeds Chilling of Lettuce From Field to Refrigerator Cars

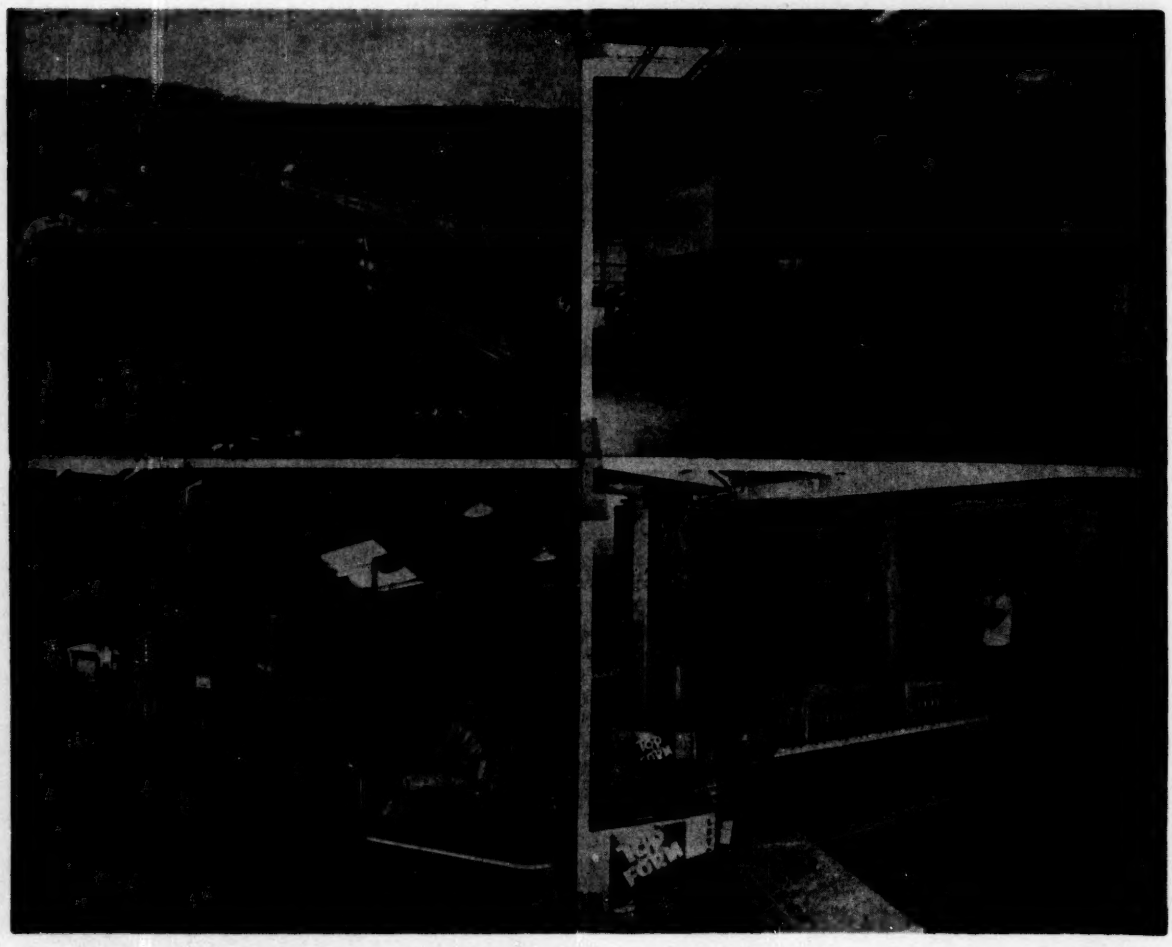
THE Crystal Ice and Cold Storage Company, Phoenix, Arizona, a division of City Products Corp., now has three Chill-Vac pre-cooling plants in operation in Arizona's Salt River Valley. Answering a growing demand for vacuum chilled produce, Crystal Ice introduced the Chill-Vac process to the valley last fall, completing its installation in Phoenix November 14, 1952. Since then additional Chill-Vac plants have been built and put into operation in the nearby communities, Glendale and Mesa. These two plants were completed in March of this year, in time for the spring lettuce deal.

Built at a cost of more than three-quarters of a million dollars, the three Chill-Vac plants now supplement the Crystal Ice Company's long-established services of shed icing and railway car and truck icing. The multi-million-dollar enterprise, headed by Wilbur F. Asbury, is prepared, on a 24-hour basis, to protect the year-round shipments of lettuce and other Salt River Valley produce.

The Chill-Vac Process

The Chill-Vac process grew out of the dry-pack method of shipping. With the lettuce cut, trimmed and dry-packed in cardboard cartons right in the field, the icing shed step is eliminated. From the field the lettuce goes by truck to one of the Chill-Vac plants and is moved on 45-foot dollies into the huge steel retorts where the vacuum chilling takes place. Each of the retorts will hold up to 400 cartons of lettuce at one time.

Heavy steel doors at both ends of the retort are lowered and locked, providing an air-tight chamber, and the chilling process begins. Electric vacuum pumps suck the air out of the retort until a vacuum is formed. Then the free moisture on the surfaces of

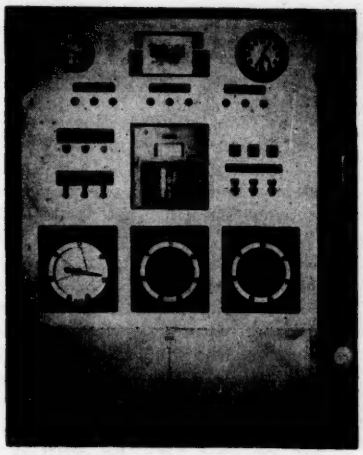


1—Field-packed lettuce in cardboard cartons trucked to Crystal Ice Chill-Vac plant to be vacuum pre-cooled for shipment to Eastern markets.

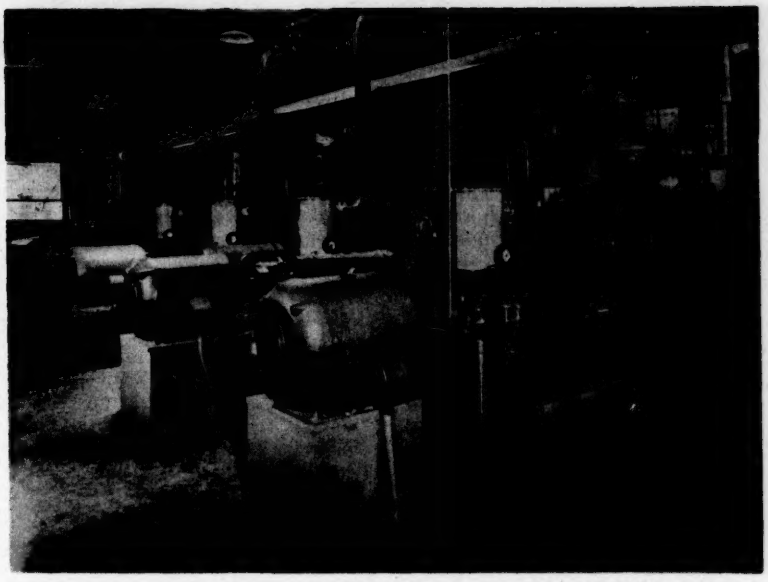
2—Loaded dollies are pushed into one of the huge Chill-Vac retorts, each of which will hold up to 400 cartons of lettuce at one time.

3—A view of the empty retorts at one of the Chill-Vac plants. In these steel chambers vacuum pre-cooling of produce takes place.

4—After being vacuum chilled in the cartons, the lettuce moves directly to loading points, to be stacked in refrigerator cars previously bunker-iced.



The Chill-Vac process requires precision control. The instrument panel, shown here, shows the temperature and air pressure for each of the retorts during the chilling process.



The engine room of one of the three Crystal Ice Chill-Vac plants, showing five two-stage vacuum pumps which remove the air from the steel retorts.

the lettuce leaves is vaporized, drawing heat directly from the leaves.

The over-all effect of this process is that every leaf is almost instantly chilled throughout to 34 degrees. The entire process takes only about 24 to 30 minutes, depending on the field temperature of the lettuce.

The pre-cooled cartons of lettuce then are loaded into the refrigerator cars, previously bunker-iced by the Crystal Ice Company.

The Chill-Vac process depends on heavy equipment. Each of the retorts is 45½ feet long, 6 feet wide, and 8 feet high. The steel walls are reinforced with 6-inch-by-6-inch steel H-beams on 16-inch centers. The entire outside of each retort is covered by ¼-inch hot rolled steel plate, to withstand an outside pressure of 15 pounds per square inch. The doors, which weigh 1,000 pounds each, are operated by electric hoists. And when lowered into place, the doors are sealed against rubber gaskets by air valves to insure air-tightness.

A system of precision controls is required to operate the machines and to assure accurate regulation of the vacuum and the temperature.

With this equipment — built by the Gay Engineering Corp., Los Angeles —the Crystal Ice and Cold Storage Company is able to bring the produce industry of the Salt River Valley the most modern methods of refrigeration. The Glendale plant, with four retorts, can fill four and one-half refrigerator cars with chilled lettuce in an hour. The Phoenix plant, with three retorts, averages three carloads per hour. The Mesa plant, operating two retorts, loads two cars per hour.

Crystal Ice plans include further expansion of the Chill-Vac facilities if demands require.

Refrigeration Research Foundation Establishes Trust Fund

IT HAS been announced by W. A. Sizer, president of the Refrigeration Research Foundation that on April 17, 1953, pursuant to directions of the Executive Commitee of the Board of Governors, a trust was created under a trust agreement with the First National Bank of Chicago, designated as "The Foundation Investment Fund" with an initial deposit of $100,000.

There were several objectives in view expressed in the deliberations of the Executive Committtee in arriving at its decision to create this trust and some of these are briefly enumerated as follows:

1. It was believed that the creation of a trust, particularly designed to accept and administer the funds of the Foundations, under the control and direction of experienced personnel, would encourage bequests and gifts from those interested in the growth and development, through research, of the art of the preservation of perishable foods and other commodities by refrigeration.

2. Such a well-administered trust should result in a substantial increase in income from such funds.

3. The Trust will relieve the Foundation Treasurer of the responsibility of the safe keeping and investment of such reserve funds and place them in the custody of a large financial institution. Trust officers are especially trained in the investment of trust funds for the greatest income return consistent with safety of the principal.

This segregation of the Foundation's funds also will serve to more clearly set apart that portion of the contributions of members allocated to future years, though not restricted to such prepayments, since all funds not considered necessary for current requirements are included therein.

It will be recalled that when the Foundation was created ten years ago, many members made initial contributions in advance, equal to five annual payments of their respective quotas and by making regular annual payments thereafter, have maintained the position of always being prepaid for five years. This was necessary in order to give the Foundation the required stability at its inception, to assure the institutions requested to pursue certain research projects that such undertakings would be carried through to completion. The members of the Executive Committee have always considered these payments made in advance as being in the nature of trust funds not to be used in current operations but only in those years to which the advance payments had been allocated.

Refrigeration of Tomatoes in Transit

By W. T. PENTZER and L. P. McCOLLOCH, Division of Handling, Transportation, and Storage of Horticultural Crops, Bureau of Plant Industry, Soil and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, Beltsville, Maryland.

A DISCUSSION of the refrigeration of tomatoes in transit might well begin with a consideration of some of the peculiarities of this temperamental vegetable. Tomatoes came from a warm region and while they are now grown thousands of miles north of their original home they still have a Latin American aversion to low temperatures. In this respect they are no different from other fruits and vegetables of subtropical origin. Bananas, mangoes, avocados, citrus fruits, summer squash, melons, sweet potatoes, cucumbers, and peppers (the last close relatives of tomatoes) have similar traits.

After a lot of experimentation research workers have found that temperatures lower than 50 F. are harmful to tomatoes. The injury does not occur when exposure is short, but if mature green fruits are exposed to low temperatures long enough, trouble can be expected when the fruits are ripened. Six days at 32 F was long enough to cause increased decay upon ripening and 9 days at 40 F had a similar effect (Table 1). In addition to causing greater susceptibility to certain types of rots, notably alternaria rot, chilling injury is manifested by slow ripening, off-flavor, pale or mottled color and if the tomato is severly injured, development of water soaked spots or blotches. The effect of exposure to 32, 40, 45, 50, 55, 60 and 70 F on rot development is shown in Fig. 1. These tomatoes were inoculated with a weakly parasitic fungus, *Alternaria tenuis* and held for 4 days at the temperatures indicated and then held an additional 14 days at 60 F for further development of decay. As shown very little decay occurred except on fruit that had been injured by low temperatures.

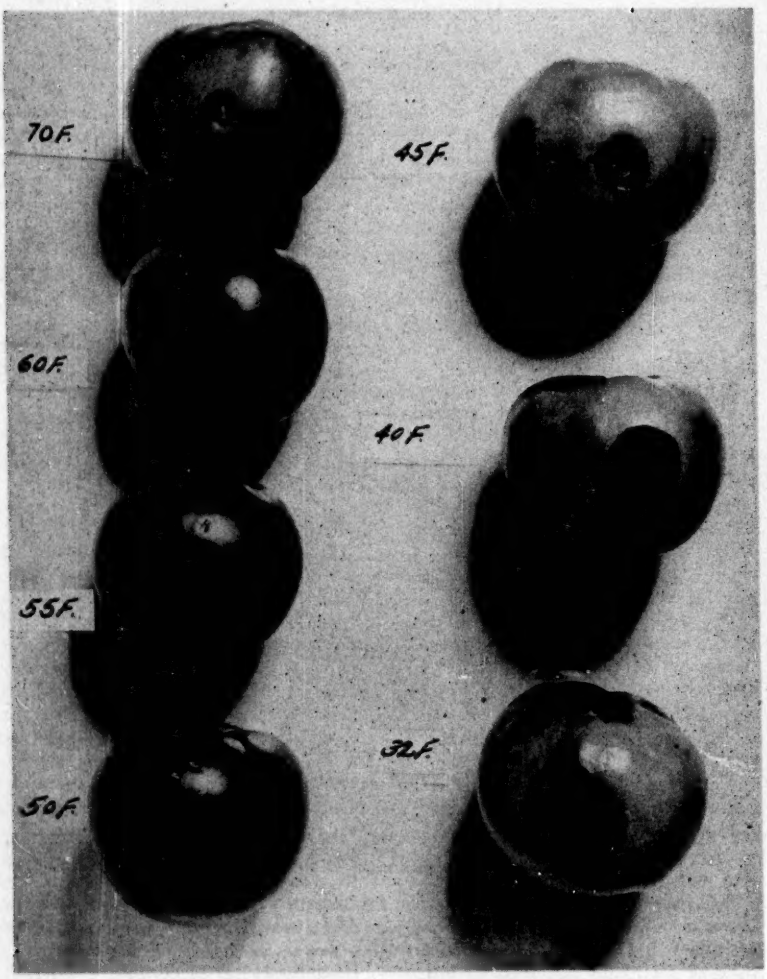


Fig. 1—Influence of temperature on susceptibility of mature green tomatoes to alternaria rot. Fruits were inoculated and held at indicated temperatures for 14 days and then at 60 F for 14 days more.

Chilling Injury

We have been considering symptoms of chilling injury and exposures severe enough to cause it. Low temperatures also retard ripening and thereby give decay organisms a longer time to attack the fruits. These effects may be apparent in tomatoes not chilled long enough to develop symptoms of chilling injury. You may ask whether these temperature effects apply only to harvested fruit. The answer is no.

Tomatoes can be chilled in the field by a period of low temperature. There is some evidence that a prolonged cold spell is more harmful than a few cool nights interrupted by warm days. In other words, the fruit may recover from the effects of a short exposure to a low temperature, but we need more evidence to say this for sure. It may also be injured by additional low temperatures in transit so that late picked fruit may be particularly vulnerable to chilling injury because it has already had some exposure to low temperature before harvest.

The effect of high temperatures on tomatoes is also of importance. Temperatures above 70 F favor the development of certain types of decay, especially soft rots. If they are too high, say 80 F or higher, ripening is retarded and an abnormal yellow color is developed instead of the typical tomato red.

Experimental Shipments Made

Probably no other fruit or vegetable is shipped under as many protective services as is the tomato. The receivers and shippers both have notions about the best practices to use and they range from full-bunker

This paper was presented at the 28th Annual Meeting of the Canadian Fruit Wholesalers held at Montreal, Canada, February 23 to 25, 1953.

TABLE 1. EFFECT OF TEMPERATURE ON RIPENING RATE AND DECAY OF TOMATOES[1]

Holding and ripening temperatures (°F.)	Total fruit	Period required for ripening as indicated[2] 70 - 80 percent Average	Range	85 - 90 percent Average	Range	Total Decay
	Number	Days	Days	Days	Days	Percent
70F continuously	196	7.3	6-10	8.8	8-11	0
65F continuously	197	8.3	7-11	10.0	8-13	0
60F continuously	203	10.5	9-13	12.8	12-15	0
55F continuously	67	12.0	9-15	16.5	14-19	0
55F for 3 days; then 65F	52	9	9	11	11	0
55F for 6 days; then 65F	122	12	11-13	13.5	13-14	0
55F for 9 days; then 65F	137	13.7	12-15	15.3	14-17	0
55F for 12 days; then 65F	67	14	13-15	16.5	15-18	0
50F for 3 days; then 65F	118	10	9-11	11.7	11-12	0
50F for 6 days; then 65F	118	12	11-13	13.7	13-15	0
50F for 9 days; then 65F	197	13.5	12-14	16.5	15-18	0.5
50F for 12 days; then 65F	197	16.3	15-18	18.3	17-20	0
40F for 3 days; then 65F	118	12.3	11-13	14.3	14-15	0.8
40F for 6 days; then 65F	196	15.0	14-18	17.3	17-18	2.6
40F for 9 days; then 65F	197	18.3	16-20	21.0	18-24	7.6
40F for 12 days; then 65F	197	22.5	21-25	[3]	[3]	27.9
32F for 3 days; then 65F	118	12.7	12-13	14.7	14-15	1.7
32F for 6 days; then 65F	200	17.5	17-18	21.0	18-25	7.5
32F for 9 days; then 65F	198	22.0	19-27	[3]	[3]	36.4
32F for 12 days; then 65F	201	[4]	[4]			58.7

1/ Summarized data from 4 tests in 1951, a dry season not conducive to decay.
2/ Firm ripe, with 76 to 100 percent of surface red color.
3/ Failed to become 85 percent ripe.
4/ Failed to become 70 percent ripe.

TABLE 2. CONDITION OF TOMATOES ON ARRIVAL FROM CALIFORNIA, CARS 1 AND 4, 1951

Position and car	Period in transit	Fruits in indicated condition Green	Turning	Firm ripe	Soft ripe	Decayed
	Days	%	%	%	%	%
Top doorway:						
Car 1	14	37	41	22	0	0
Car 4	10	61	20	19	0	0
Bottom bunker:						
Car 1	14	67	28	5	0	0
Car 4	10	77	16	7	0	0

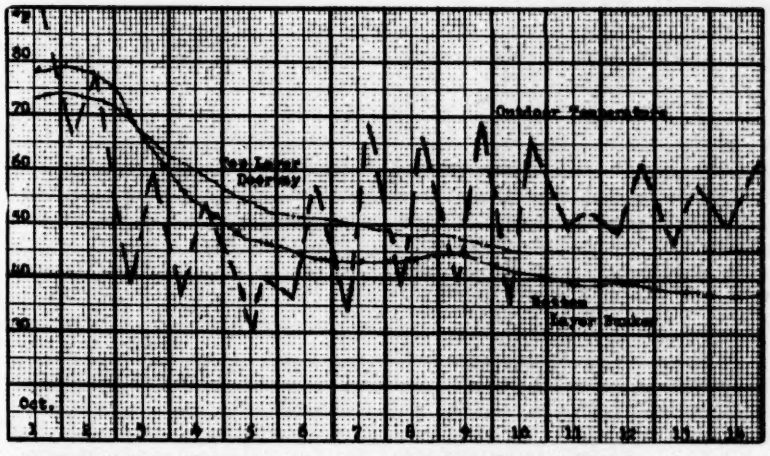
standard refrigeration to no ice at all or combinations of icing and ventilation. Sometimes ice is placed in the bunker at one place and removed at another where heaters are installed. The vagaries of weather and markets complicate the problem of selecting a suitable refrigeration service.

We have been working with tomato shippers on their problems for a long time, trying to learn what temperatures are obtained with less than full-bunker icing and under ventilation services. During the past two seasons good progress was made thanks to the cooperation of receivers, shippers, and carlines. By following part of the commercial shipment from the field through the ripening room we began to see the whole picture. The final pay-off is the amount of marketable tomatoes ripened from the car. Briefly, the methods we used in this work involved checking the temperature of the tomaotoes when they were loaded, placing recording thermometers in the top and bottom layers of the car at the shipping point, (the warmest and coolest parts of the load) and shipping some cars under refrigeration services now in use and others in which the aim was to get temperatures in the desirable range of 50 to 65 F which we know will not chill tomatoes.

These services, of course, vary somewhat with the season of the year. The important consideration, when the fruits were loaded warm, was to place enough ice in the bunkers to give the moderate cooling that tomatoes require. The temperature of the tomatoes when loaded was the controlling factor. In the warm months one re-icing in transit may be required to take care of heat leakage. Upon arrival, test packages containing the recording thermometer were removed and the fruit was ripened under controlled conditions. Tomatoes from twenty-five lugs in the bottom layer of the car and a similar number from the top layer were ripened with the rest of the car and records on marketable fruit and discards were taken at each sorting. Tests were made on the fall crop from California, winter shipments from Florida, and the early summer Texas crop. In addition some records were obtained on shipments of Mexican tomatoes from Nogales, Ariz., to destination. Let's look at some of the results.

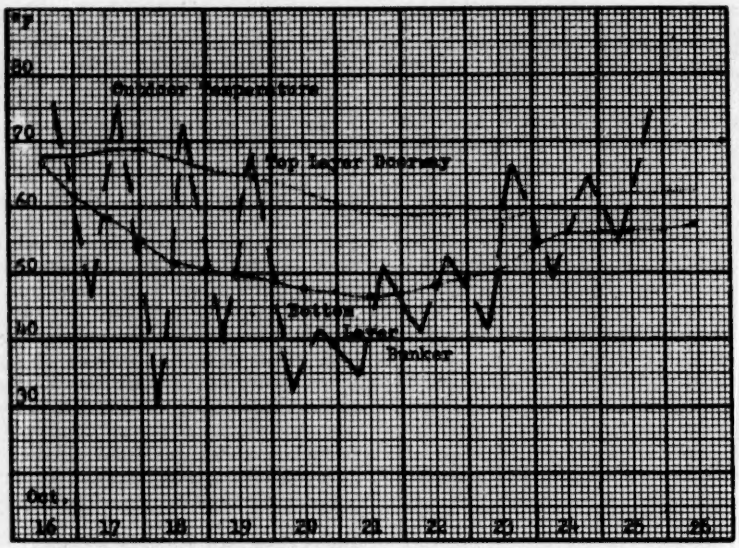
Too Much Ice Favors Decay

A good example of over-icing was obtained in a car shipped from California in October 1951. This car was loaded October 1 with tomatoes having an average temperature of 76F. It was iced after loading at Stockton, Calif., with 1½ tons of ice in each bunker and was shipped vents closed to Ogden, Utah, and then standard ventilation to Peoria, Ill., where it was re-iced to capacity and diagonal vents were opened for the rest of the trip to New York. The temperature of top and bottom layers in this car are shown in Fig. 2. It is evident that the bottom layer was too cold by the 5th day in transit and that even the top layer was too cold during the last half of the trip. We can compare with this car another one which was handled much



Car 1. Initial ice 1½ tons each bunker at Stockton, Calif. 10/2. Reice to capacity at Peoria, Ill. 10/8. Standard ventilation Patterson to Stockton, vents closed Stockton to Ogden, standard ventilation Ogden to Peoria, diagonal ventilation thereafter. Arrived 10/11, unloaded 10/15.

Fig. 2—Temperature of tomatoes in non-fan refrigerator car Patterson, Calif. to New York City via Ogden, Utah, October 1, 1951.



Car 4. Initial ice one ton each bunker at Brentwood, 10/16. Do not Reice. Vents closed Brentwood to Kansas City, Mo. Diagonal ventilation thereafter. Arrived 10/25, unloaded 10/26.

Fig. 3—Temperature of tomatoes in non-fan refrigerator car Brentwood, Calif. to New York City via Ogden, Utah, October 16, 1951.

the same, except for omission of the re-icing at Peoria. It had good temperature, above 50 F mostly (Fig. 3). The inspection records for the tomatoes in these two cars on arrival and after ripening are shown in Tables 2, 3, and 4. The important conclusion was that decay was high—12 to 14 percent in tomatoes from the cool part of the car re-iced in transit, whereas decay was negligible in the car not re-iced. Condition on arrival was no indication of poor ripening quality.

Low Field Temperatures and Late Pickings Favor Decay

Another important point brought out by these tests is that exposure to low temperatures in the field if long enough favors poor ripening and decay. If additional chilling injury takes place in transit, results may be disastrous. Data taken by the University of California at Davis in 1951, illustrate this very well (Table 5). Commercial shipments in November 1951 provided additional evidence of the bad effect of low transit temperatures on late picked tomatoes. One car (car 7) was iced with 1½ tons of ice in each bunker at Colton, California, when it did not need ice, since the temperature of the tomatoes when they were loaded was 60 F. The bottom layer of the car was below 50 F soon after icing (Fig. 4). The other car (car 8) was not iced but moved under standard ventilation under favorable outdoor temperatures (Fig. 5). The tomatoes in the iced car developed excessive decay when ripened, as much as 28 percent in lugs from the bottom layer as compared with 4 percent in the warmer car (tables 6 and 7).

Distance to be Shipped Important in Refrigerating Tomatoes

Our work with Florida shipments brought out another point of interest. When the time in transit is only a few days there is not likely to be trouble from low temperatures. Even in over-iced shipments tomatoes reach the market by the time they are cool and unless they are held on track several days the exposure to chilling temperatures will be too short to harm them. On the other hand, because of the short time in transit there is probably little need to ice Florida shipments more than enough to cool them to 60 to 65 F. Most tomatoes require 6 to 8 days to ripen at these temperatures and initiation of ripening during transit will shorten the time needed in the ripening room and reduce costs of ripening. We found in truck shipments in January and February, that desirable temperatures could be obtained by ventilation alone and in mid-April and later, icing the bunkers and operating the mechanical blowers cooled the load to about 65 F. The truck driver was given instructions to base his ventilation or icing practices on the temperature of the load.

TABLE 3. CONDITION OF TOMATOES AFTER 2 WEEKS' RIPENING AT 68F. (AVERAGE OF 2 TEST LUGS IN EACH POSITION), CARS 1 AND 4, 1951

Position and car	Fruits in indicated condition					
	Good	Fair	Poor	Culls	Not ripe	Decayed
	%	%	%	%	%	%
Top doorway:						
Car 1	55	33	7	1	3	0
Car 4	41	60	3	0	4	1
Bottom bunker						
Car 1	7	42	20	5	14	12
Car 4	26	46	8	0	19	1

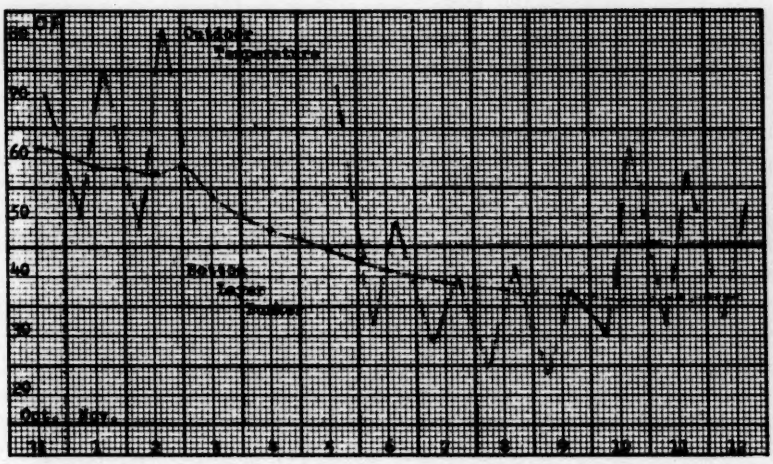
TABLE 4. CONDITION OF TOMATOES FROM COMMERCIAL LOAD AFTER TWO WEEKS RIPENING (AVERAGE OF 25 LUGS AT EACH POSITION) CARS 1 AND 4, 1951.

Position and car	Fruits in indicated condition		
	Decayed	Soft poorly colored	Total unmarketable
	%	%	%
Top doorway:			
Car 1	1.6	0.4	2.0
Car 4	0.6	0.6	1.2
Bottom bunker:			
Car 1	9.6	4.7	14.2
Car 4	0.8	1.2	2.0

TABLE 5. EFFECT OF LOW FIELD AND STORAGE TEMPERATURES ON MARKETABILITY OF RIPENED TOMATOES, CALIFORNIA, 1951 1/

Date picked	Time below 50F. in field	Direct to 68F. ripening room	Delayed 10 days at 41F. before ripened
	Hours	% Unmarketable	% Unmarketable
October 1	32	3	8
16	98	1	8
23	145	2	28
30	218	15	42
November 7	273	14	50

1/ Data obtained by L. L. Morris, Department of Vegetable Crops, University California, Davis, California, Vegetable Crops Series 57, January 1953.



Car 7 Initial ice 1½ tons each bunker at Colton, Calif. 11/2 standard ventilation Tracy to destination. Arrived 11/10, unloaded 11/12.

Fig. 4—Temperature of tomatoes in a non-fan refrigerator car Tracy, Calif. to New York City via El Paso, Texas, October 31, 1951.

Ventilation of Iced Cars In Warm Weather

In our work on Texas tomatoes during June we had an opportunity to check a number of cars ventilated with diagonal vents open after re-icing. Warm outside air entered the car day and night, for the vents remained open, and by the time the cars reached East St. Louis the bunkers were often empty and the tomatoes still warm, 75F or more. These tests and others we made in July shipments from California indicated that ventilating iced bunkers accomplishes very little except meltage of ice. A better practice is to use enough ice to cool the tomatoes to 60 to 65 F and take care of heat leakage in transit and keep the vents closed at least until the benefit from the ice has been obtained. In hot weather shipments from Texas, initial full bunker icing and one re-icing were sufficient. Standard refrigeration supplied more refrigeration than needed for the 6-day transit period to New York.

Ventilation in Fall Shipments

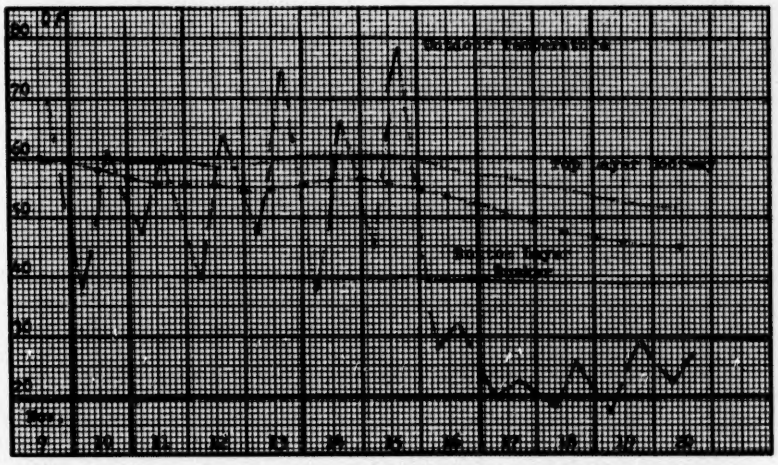
We compared shipments of tomatoes from California moved under ventilation in October with other cars in which the vents were kept closed to destination. The idea behind the latter practice was to take advantage of the insulation value of the car to maintain desirable temperatures rather than depend upon the manipulation of ventilators to accomplish this. Some of our ventilated shipments were iced to remove field heat from the tomatoes and the cars were placed under ventilation services after several days in transit. We noticed no harmful effect on ripening from keeping the vents closed and there was no accumulation of carbon dioxide from the tomatoes. Whether better temperatures can be obtained by this practice than by ventilation is not yet determined. Temperature records in two cars are compared in Fig. 6.

Winter and Spring Shipments From Mexico

Thanks to the cooperation of a firm using a considerable quantity of Mexican tomatoes we obtained some information on the temperatures in about 150 cars as they crossed the border at Nogales, Ariz., the amount of ice left in the bunkers and the condition on arrival. The records were taken between February 9 and April 29, 1952. We would consider that all the loads were cooled adequately by the time they had reached the border and that most were too cool. About 70 percent had temperatures of 50 to 59F at the top layer doorway and at the bottom layer doorway 70 percent had temperatures of 45 to 55 F. None of the cars had temperatures above 67 F. Fruit temperatures in about 30 percent of the cars were 40 to 49 F at bottom doorway and temperatures considerably lower would be expected nearer the bunker. These temperatures are too low for tomatoes. Most of the cars had 3 feet of ice or less in the bunkers on arrival at Nogales, Ariz. Certainly for cool weather shipment no additional ice was needed for these tomatoes and it seems reasonable that for late spring shipments or those going into the South that the ice remaining in the bunkers of many cars would have been adequate. Some cars were over-refrigerated by the time they reached Nogales, making the problem one of warming the tomatoes rather than supplying more refrigeration.

Summary

Tomatoes can be damaged by low temperatures that would be perfect for many other fruits and vegetables. Six days at 32 F or 9 days at 40 F weakened the fruit so much that some developed decay typical of that found on tomatoes known to have chilling injury. Other symptoms of chilling are slow ripening, off-flavor, pale or mottled color and sometimes water soaked spots or blotches. A temperature of 50 F is as low as safe for holding tomatoes



Car 8. No ice, standard ventilation Carbona to Destination. Arrived 11/15, unloaded 11/20.

Fig. 5—Temperature of tomatoes in a non-fan refrigerator car Carbona, Calif. to Chicago, Ill. via El Paso, Texas, November 9, 1951.

and even here ripening of many fruits is very slow. Slow ripening allows more chance for decay to develop than if ripening proceeds at a normal rate. A temperature of 65 F is ideal for ripening tomatoes. Transit temperatures of 50 to 65 F are recommended. Low field temperatures prior to shipment can contribute to the damage done in transit, and holding on track or in storage before ripening is also risky. The ice needed by tomatoes is governed largely by their temperature when loaded and to a less degree by outdoor temperatures in transit. Ventilation of iced cars during warm weather is wasteful of ice and may prevent cooling of the load. No harmful effects were observed from shipping cars with vents closed to destination after moderate icing to cool the load. Winter and spring shipments from Mexico were cool enough by the time they reached Nogales, Ariz., to require no additional refrigeration in cool weather and only a few additional tons of ice if they were moving into warm territories. Most cars were too cool when they arrived at Nogales.

TABLE 6. CONDITION OF CALIFORNIA TOMATOES ON ARRIVAL, CARS 7 AND 8, 1951.

Position & car	Period in Transit	Fruits in indicated condition				
		Green	Turning	Firm ripe	Soft ripe	Decayed
	Days	%	%	%	%	%
Top doorway:						
Car 7	12	60	32	7	0	1
Car 8	11	22	46	28	0	4
Bottom bunker:						
Car 7	12	74	22	3	0	1
Bottom doorway:						
Car 8	11	43	38	17	0	2

TABLE 7. CONDITION OF TOMATOES IN TEST LUGS AFTER 2 WEEKS' RIPENING AT 68°F. (AVERAGE OF 2 TEST LUGS IN EACH POSITION), CARS 7 AND 8, 1951.

Position and car	Fruits in indicated condition					
	Good	Fair	Poor	Culls	Not Ripe	Decayed
Top doorway:	%	%	%	%	%	%
Car 7	7	36	17	2	23	15
Car 8	50	24	11	3	4	8
Bottom bunker:						
Car 7	5	17	12	4	33	28
Bottom doorway:						
Car 8	46	28	12	3	7	4

Acknowledgments

The information presented has come in part from the following sources:

Refrigeration of tomatoes in transit. L. P. McColloch and W. T. Pentzer. Pre-Pack-Age 6:1, 11, 14, September 1952.

Shipping tests with California mature green tomatoes, Fall 1951. W. R. Barger, W. A. Radspinner, B. A. Friedman and L. L. Morris. U. S. Bur. Plant Indus., Soils, and Agr. Engin., H.T.&S. Off. Rpt. 286, Calif. Veg. Crops Series 57, January 1953.

Transit studies with tomatoes. W. R. Barger and L. L. Morris. Progress Rpt. Division of Truck Crops, Calif. Agr. Expt. Sta., Davis, Calif., 1942.

Texas tomato shipping test from South Texas to Jersey City, N. J., May 1950. H. B. Johnson, W. R. Buford, B. A. Friedman, and J. S. Wiant. U. S. Bur. Plant Indus., Soils, and Agr. Engin., H.T.&S. Off. Rpt. 246, May 1951.

Shipping and ripening tests with Texas tomatoes, June 1951. H. B. Johnson, R. E. Hardenburg, B. A. Friedman, and W. R. Buford, U. S. Bur. Plant Indus., Soils, and Agr. Engin. H.T.&S. Off. Rpt. 265, May 1952.

Unpublished data furnished by W. R. Barger, H. B. Johnson, B. A. Friedman, W. A. Radspinner, J. R. Winston and Randall Cubbedge of the Division of Handling, Transportation, and Storage of Horticultural Crops, U. S. Department of Agriculture and L. L. Morris, Department of Vegetable Crops, California Agricultural Experiment Station. The cooperation of the Atlantic Commission Company, other receivers and shippers, the Pacific Fruit Express Company, and the Fruit Growers Express Company is gratefully acknowledged.

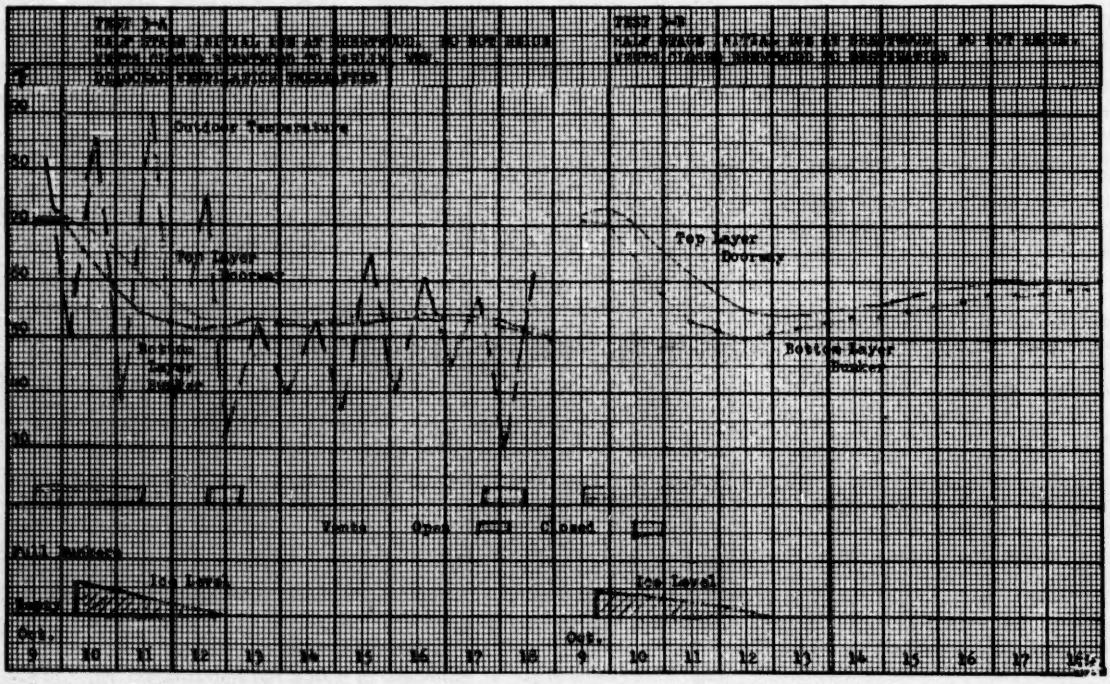


Fig. 6—Temperature of tomatoes in fan refrigerator cars, Brentwood, Calif. to Jersey City, N.J. Oct. 9, 1952.

Fig. 1—Interior of LaCrosse Curling Club where curlers play the ancient Scottish game from November through April. Note pebbly condition of ice, a "must" for curlers. A 50-ton packaged water chiller provides a below-freezing mixture of water and ethylene glycol through more than four miles of piping.

ICE RINK DESIGNED FOR CURLING

How A Modern Ice Rink, Installed in Agricultural Fair Building, was Designed to Meet Needs of Curling, An Ancient Scottish Sport Which Requires Special Kind of Ice

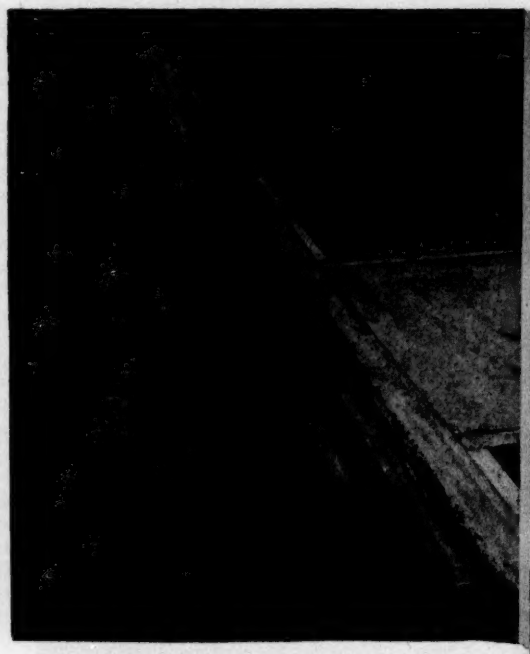
JACK WILLIAMS
The Trane Company
LaCrosse, Wisconsin

BECAUSE curling, and a special sort of ice go together, this ancient Scottish sport has, up to now, depended on an unpredictable Nature for its ice supply. Confined to northern climes for a short season of six weeks or less — "bonspiels," or curling tournaments, could be scheduled only on an "if, as and when ice forms" basis.

Modern refrigeration, utilizing "packaged" water chillers, has made artificial ice available to curling clubs at a cost at least bearable by the larger organizations. The problems in adapting the water chiller to the ice-making system, and design of the complete system especially adapted to the needs of curling, make an interesting story that is, today, being repeated in many cities throughout the country, as curling club activities increase. The modern refrigeration equipment lengthens the curling season and enables dependable "bonspiel" arrangements to be made. The entire ice-making project becomes feasible and self-supporting to smaller clubs, because, by offering improved, dependable ice facilities they can attract a larger membership to support the cost of the project.

The La Crosse, Wisconsin curling club, is a typical example of the application of artificial ice-making equipment to curling. Although outdoor design temperature is minus 27 F in La Crosse, a series of unpredictable weather conditions provided several especially trying seasons for curling club members, and the club then decided to install ice-making equipment.

Artificial ice is easier said than accomplished — especially ice for curling. Once the ice is frozen, it must be "pebbled"; a process of sprinkling the ice with droplets of water which



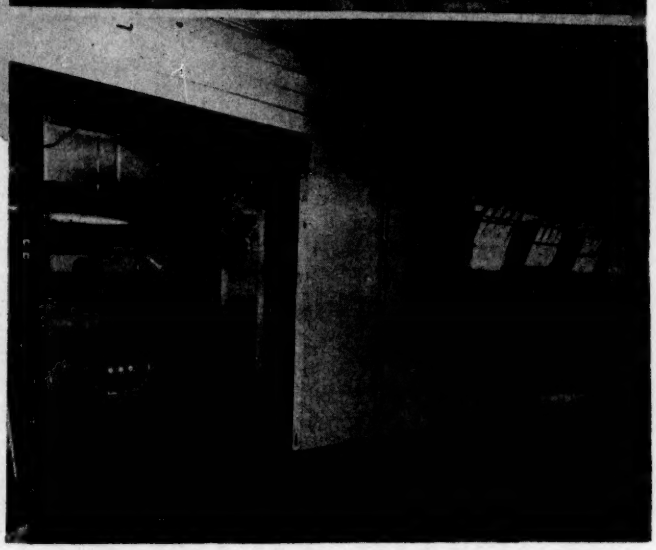


Fig. 2 (Above) Main supply and returns run in this trench at the end of rink. Note the asphalt covering over wrought iron piping at the right.

Fig. 3 (Upper Right) A "rabbit's eye-view" of a section of the 1¼ in. wrought iron pipe laid on 4½ in. centers. Note depression at lower right, used to form a dip (or hack) for the footholds from which curlers deliver the curling stones.

Fig. 4 (Right) The packaged water chiller shown above, left, supplies a cold mixture of ethylene glycol and water to pipe banks for freezing rink water.

freeze in disks about the size of quarters and ten times as thin. This provides the surface on which the curling stones, with their inverted saucer-like bottoms, can run.

The building housing the present curling rink is most unusual. it was, and is, a cow barn used once each year by an inter-state fair committee to display prize cattle. The long building, (Fig. 1) erected on a clay base and constructed of hollow tile, is ideal for curling. It is sufficiently long to accommodate the customary 144 foot length of a curling rink, plus a few extra feet for a club room, and is wide enough for four rinks.

A long term lease was arranged to rent the building for curling, with the stipulation that it be returned to its original condition for one Fair Week each year. That meant that once each year the floor had to be cleared of all obstructions and restored to a condition comparable to a clay surface. Either the customary piping of an artificial ice plant had to be removed, or some means had to be found to conceal them in a substance resembling clay.

Space was another problem because all that the curling club had available for an equipment room was a small eight by ten room used for storing curling stones. Here is how the curling club at La Crosse, Wisconsin started the 1953 season on artificial ice:

The Floor

The clay floor was removed and a 12-inch sand fill laid to provide adequate drainage. Over this sand fill a 4 inch slab of concrete was installed, after a manhole in the center of the building had been raised sufficiently to provide the necessary strength to support feed trucks and animals to be housed in the building during Fair Week. Trenches were also provided across the building between the end of the rink area and the club rooms, connecting to a pipe pit in the corner of the equipment room to accommodate supply and return headers, as shown in Fig. 2. Thermometer wells were spotted around the perimeter of the ice area.

The Pipe Coils

The entire ice area was separated by a raised walkway which divides sheet 1 and 2 from sheet 3 and 4. Each sheet accommodates a curling game, so four games can be played simultaneously at the La Crosse club. A total of 37 circuits of 1¼ inch wrought iron pipe was laid on 4½ inch centers, directly on the concrete slab of each section; a section covers an area 144 feet long and 28½ feet wide. A total of almost four miles of pipe was utilized.

All pipe joints were welded with U-bends, joining the circuits at the far end of the rinks. Special arrange-

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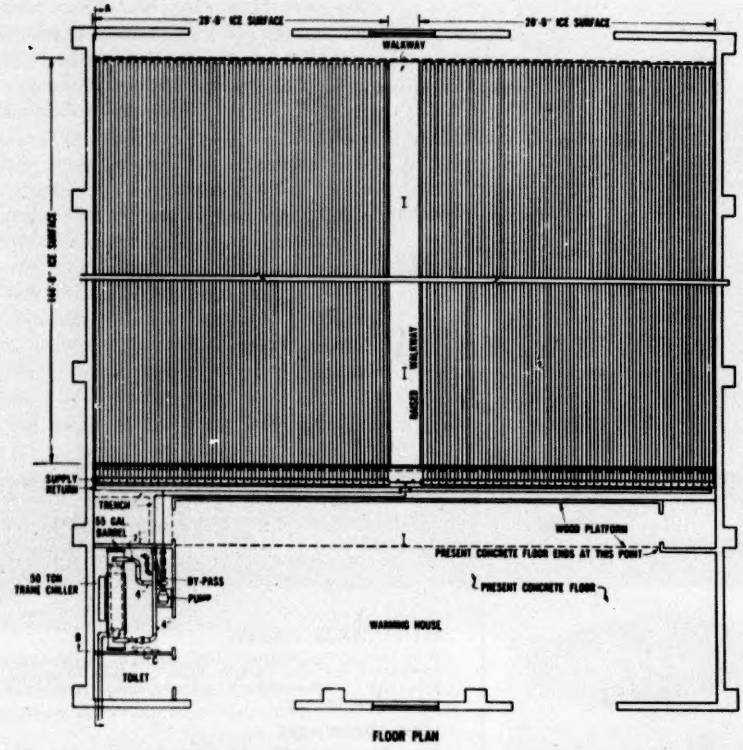


Fig. 5—Pipe coil layout for ice area for curling. There are four sheets to accommodate four curling games simultaneously. A total of 37 circuits of 1¼ in. wrought iron pipe on 4½ in. centers is laid on a 6 inch concrete slab. Nearly four miles of pipe was used to complete the system through which a mixture of ethylene glycol and water is circulated to freeze a ½ in. sheet of ice.

ments were made for hacks, the footholds from which the players deliver the curling stone. The pipe at these points was bent downward to form a dip, shown at far right in Fig. 3. In this depression a wooden and rubber foothold was placed.

One leg of each pipe loop was welded to a 3 inch supply header, the other to a return header, both of which were laid in the trench at the end of the rink.

Once all welding was completed, the entire system was tested at 85 lbs. air pressure for a three-day period. Every joint was checked and rechecked, since any leak could cause considerable trouble. Finally the entire ice area was covered with a two-inch coat of asphalt finish. This unique arrangement concealed all the piping and furnished a non-skid floor surface for the show cattle.

The Refrigeration System

The unusual part of the installation is the refrigerant and refrigeration system. Because of the space limitation, the most compact refrigeration equipment was sought. To meet these requirements, a Trane Cold Generator was selected, shown in Fig. 4. This unit, a packaged water chiller assembly, consists of a 50-ton Freon compressor directly connected to a 40 hp motor, a 25 ton condenser and a 25 ton chiller, all mounted on a common base. Installation was simple, since the unit had been factory evacuated, charged and tested. With this arrangement, only 30 square feet of floor space was used. When a 3 hp coolant circulating pump was added, it was found that the entire refrigeration system could be packed into an 8 x 10 x 8 ft space, as shown in Fig. 4.

The Coolant

Instead of circulating the customary brine in the pipes, a mixture of ethylene glycol and water was used. This coolant, compared to brine, is somewhat more expensive, but less corrosive. In addition, a corrosion inhibitor can be added yearly, as in automobile radiator cooling systems. The solution as used has a freezing point of minus 25 F. The regular winter design condition of the area was selected as a safe freezing point since the temperature in the average rink house seldom reaches outside minimum. And, even if an unusual cold period occurs, the solution will not freeze solid.

Approximately 700 gallons of ethylene glycol were required to charge the entire system. To provide for air venting and expansion, especially during summer months, a 15 gallon expansion tank with sight glass is provided. During the season the tank is equipped with a manual air vent, and in off seasons the air vent is connected by means of a hose, to a 55 gallon storage tank. In this way, any over-flow of solution from the system is trapped in the drum.

Two Temperatures

In operation, the system was arranged to supply the coolant at two temperatures. The first is the "freeze" temperature set at 12 F. This stage is used to cool the slab down preparatory to the initial freezing of the ice. Under usual conditions it requires about ten hours to cool the slab down and make ice.

The second is the "hold" temperature which is set at 21 F, which is maintained to prevent moisture from forming on the surface of the ice.

How It Operates

A master switch with three positions makes it possible to set the system for either the "freeze" or "hold" temperature, or for shut-off. When the rinks are to be flooded the switch is set for "freeze" which keeps the ethylene glycol circulating pump on continuous operation. A temperature controller in the inlet of the chiller set at 15 F controls the "freeze" cycle. As the temperature controller calls for refrigeration, it turns a motor with auxiliary switches which start the compressor, and opens the solenoid valves in sequence to admit refrigerant to two circuits of the chiller. This motor is also linked to the pressure adjusting device on the compressor unloader control mechanism so that as the temperature is reduced the unloader reduces capacity of the compressor.

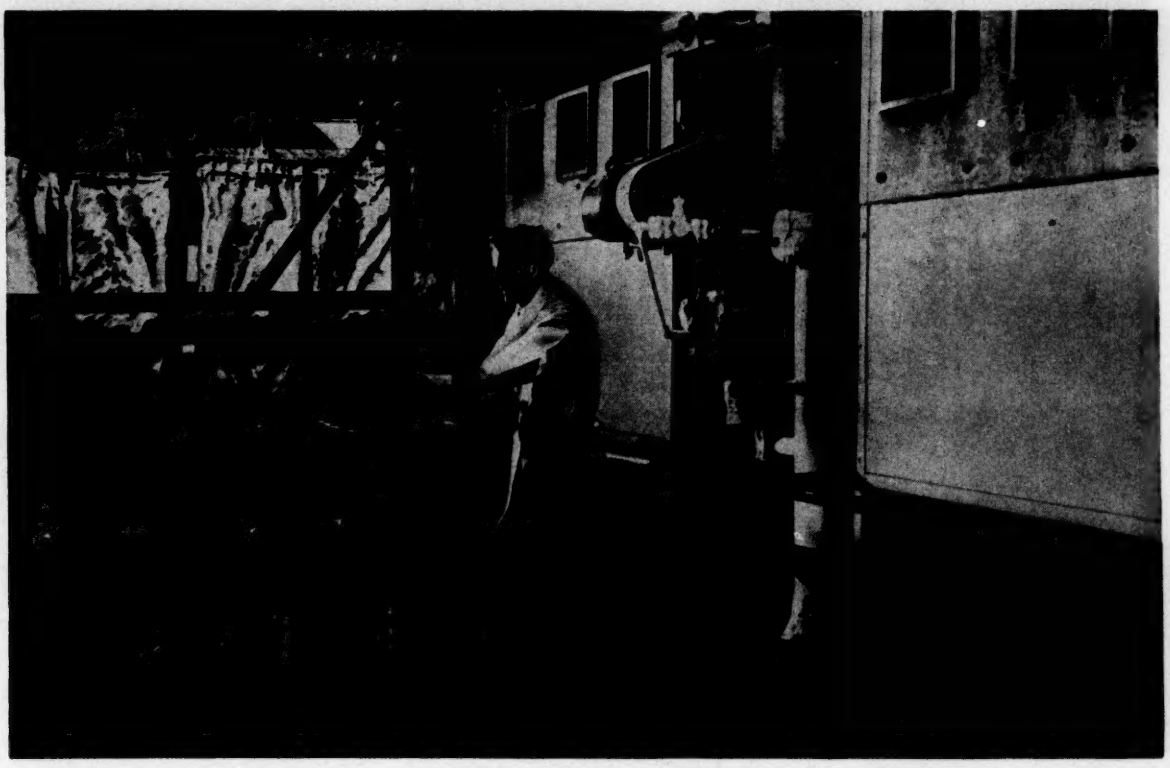
At about one-half capacity, both circuits of the chiller are not needed and the auxiliary-switching mechanism shuts off one solenoid valve. In this way, a constant unvarying chilled liquid temperature is held for freezing purposes with a minimum power input for refrigeration.

Once the ice has been made, the system is reset manually for the "hold" temperature. Three thermostats located at separate points in

ammonia refrigeration

helps Burk's make better bacon

There are two things worth noticing in this photograph taken at Louis Burk, Inc., Philadelphia, Pa. One is the way slab bacon is being moved. It's trucked into the freezer room on smokehouse trees, thus eliminating the expense of handling. The other thing is the refrigeration equipment in the background. Burk's use Carrier Ammonia Cold Diffusers to blast-freeze bacon, thus preserving the quality and flavor of the freshly smoked product and preventing loss of weight from fat drip. After an hour in the freezer room, the bacon is "shell" frozen enough to retain its shape between the hydraulic forming press and the high-speed slicing machines. ▪ Burk's have Carrier Ammonia Cold Diffusers in the packing room, too. They keep the air at



a constant 50° and the dewpoint below the bacon temperature so that moisture will not form on the cold slices. The bacon never loses its color. And the cellophane packages never look foggy. ▪ Carrier Ammonia Cold Diffusers help Burk's maintain their famous quality all the way from the kill floor to the delivery trucks. ▪ Wherever temperature or moisture affects the quality of a food product, Carrier Ammonia Refrigeration can be expected to help you in the processing, packaging or storage. Carrier's complete line of ammonia equipment is backed by over 50 years of experience, includes compressors, cold diffusers, evaporative condensers. For information write Carrier Corporation, Syracuse, New York.

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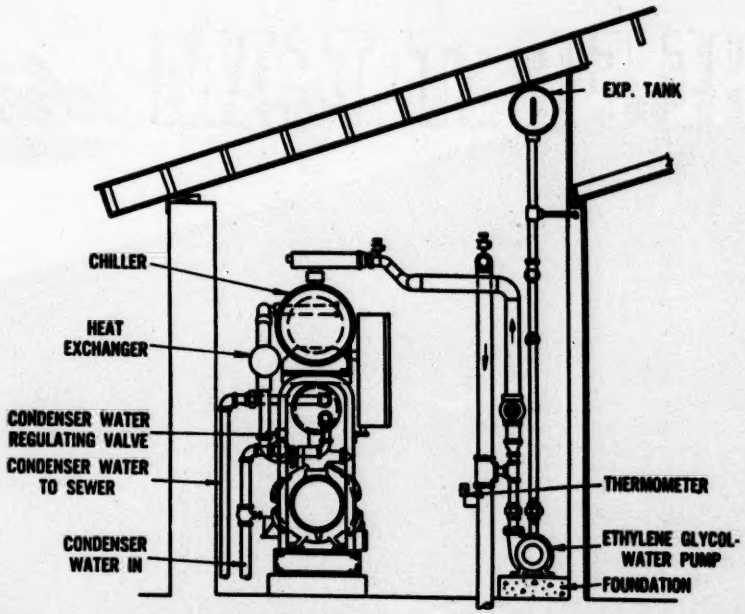


Fig. 6—Details of the water chiller hook-up. A 50-ton unit was used to chill down 700 gallons of ethylene glycol circulated in pipe coils. The 50-ton reciprocating compressor is directly connected to a 40 hp motor, a 25-ton condenser and a 25-ton chiller, on a common base, using only 8 x 10 x 8 ft. floor area.

the rink house are wired in parallel. When any one thermostat demands cooling, the circulating pump is started. A second temperature controller in the inlet of the chiller, and set at 25 F, now controls the "hold" temperature cycle in much the same way as described above. It is on this cycle that the power-saving is most noticeable since the circulating pump and the compressor will operate only when needed and at the capacity required.

Once the refrigeration requirements have been filled, the refrigeration system compressor pumps down, shuts itself off, and remains ready for the next call for cooling from the rink thermostats.

The system can also be operated so that any combination of the four rinks can be flooded at one time. Manual shut-off makes it possible to flood just one rink at a time. For future use, sufficient capacity is available so that a fifth sheet of ice could be handled.

The Results

During the past curling season, power costs were carefully analyzed. It was found that costs were in the neighborhood of $100 per month during the colder months, and no more than $200 in the warmest month. This cost was based on an average kilowatt rate of .03 cents, which is higher, generally, than average. Ice was ready on November 1 and the season ended on April 1, even though March was unseasonably warm. During all this time, ice was maintained in a suitable condition for curling. Approximately ½ inch thickness was found to be most satisfactory, as extra thickness defeats its own purpose and acts as an insulator.

Converting the building back into a cow barn is exceedingly simple. In the spring the system is closed down and the ice allowed to melt. A sealed up drain is opened and its solid cover replaced with a grated one which permits water to run off and makes it possible to clean and disinfect the inside of the building at any time. Since all of the refrigerating equipment is in one small room it can be locked away from the rest of the area. Collapsible walls between the rink house and club room are easily removed.

Total contract price for the four sheets of ice was approximately $26,000. This included excavation, sand fill, 4 inch slab, 2 inch ramcoat asphalt finish, piping and all the refrigeration equipment.

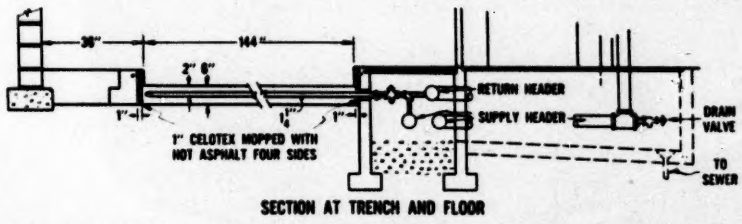


Fig. 7—Details of curling rink construction at trench and floor, show supply and return header arrangement. Note drain arrangements from supply header, and pipe coil layout over slab. Four sides of excavation for slab are hot mopped with asphalt over 1 in. celotex. Pipe is laid on the 4 inch slab and covered with 2 inch asphalt finish.

Annual Ice Convention Preliminary Announcement

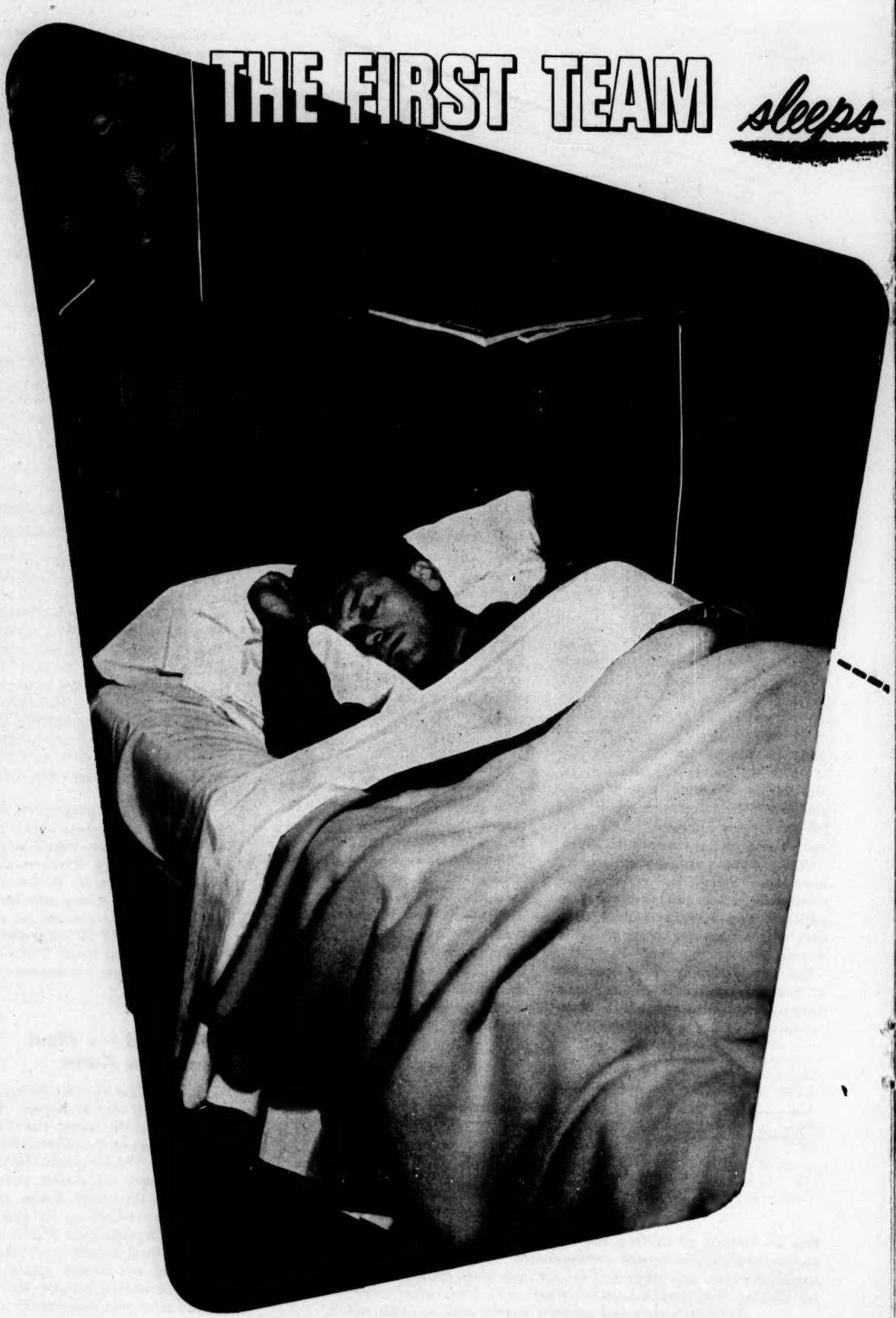
PRELIMINARY convention announcement to the National Association of Ice Industries calls attention to the Hotel Statler in Washington, convention headquarters, as one of the world's newest, finest, and most beautiful hotels—actually designed for conventions, exhibits and banquets, and for the pleasure of the people who attend them. It is completely air conditioned. All guest rooms are planned and furnished to serve as a bedroom at night and a living room during the day.

The convention program, it is promised, will be the best ever. There'll be speakers of prominence with down-to-earth messages. Members will have plenty of opportunity to discuss their problems with others who have had similar problems and who have solved them. There will be fact-packed panel sessions—two of them. There will be time for private conferences on the side.

Cleveland Ice Plant Moved to Korea

A CLEVELAND ice-making plant is on the way to Korea. A South Korean mission bought the plant and 12 Koreans came to Cleveland to dismantle it. The Cleveland Home Brewing Co., once the plant's owner, was sold to a Cincinnati group, and then the plant was put up for sale by the Effron Corporation, a firm of auctioneers. Effron valued the plant, which can turn out 250,000 pounds of ice daily, at around $175,000, but no purchase price was made public.

THE FIRST TEAM *sleeps*



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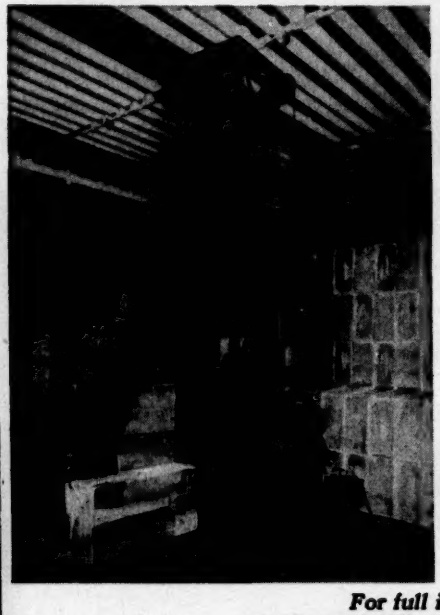

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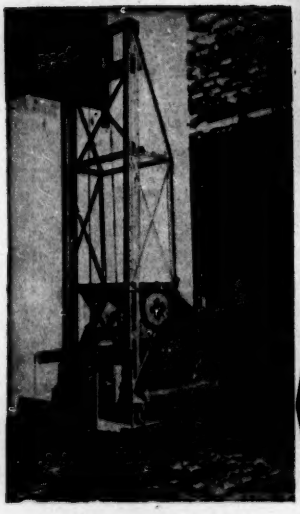

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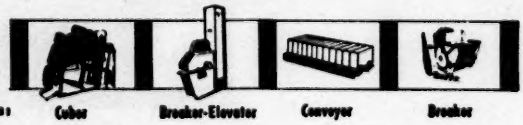

Circle No. 16 on Reader Service Card

Storage of Onions—Spoilage is Reduced By Controlled Temperature and Humidity

TEXAS' sweet Bermuda onion may assume a new significance in the state's economy if a series of experiments being conducted at Alford Refrigerated Warehouses in Dallas prove successful.

Center of the project is an effort to reduce spoilage in storage through controlled temperature and humidity. Rot-losses in the past have been so heavy as to make long-term storage impractical.

As shown in this article, tests have proven conclusively that onions remain in excellent condition in refrigerated storage over a long period of time under 35 F temperature and 50 percent relative humidity.

Bags of onions in storage in Alford Refrigerated Warehouses, Dallas, Tex.

Texas' onion crop is the most widely distributed in the state and it usually is one of the first three in volume of market movement. Principal producing points are in the lower Rio Grande Valley, Winter Garden, Laredo and Eagle Pass areas, Coastal Bend and the Collin-Dallas-Ellis county area.

Fred F. Alford, president of Alford Refrigerated Warehouses, Inc., believes he has licked the problems of temperature and humidity in onion storage. A small-scale test last year proved that the sweet Bermudas can be stored up to five months with temperature at 35 F in a relative humidity of 50 per cent without heavy spoilage.

This year Alford has put 44 carloads (21,881 50-pound bags) in storage. If these keep as well as those did last year, he will begin storing the onions on a commercial basis in 1954. Mr. Alford said his company has already invested around $10,000 in the experiments, "and if our theories prove correct we're ready to spend $50,000 in equipment next year to store onions commercially."

Texas onion growers have always taken a beating on their crops because, being unable to store the eye-watering vegetable, they have to dump their whole harvest on the market at a time when prices are low.

With current prices ranging around 80 cents per 50-pound sack, some farmers in North Texas are finding it cheaper to plow their crops under than to try to market them. Last winter, cheaper grade onions, many of them imported from Mexico, were selling for around $5.50 per sack.

Should the Alford experiments prove successful, the farmer will be able to store part of his crop for several months. This will enable him to not only get a better price for his yield in the spring and early summer, but also give him a good shot at the rich winter market.

Alford also is conducting an experiment on the use of a new-type "box pallet," which plays no small part in the long-term preservation of the sweet Bermudas. This pallet is about three feet square and has sideboards that permit multiple stacking and a free flow of air around each sack.

By using these pallets, Alford can nearly triple his capacity to store onions, because the strong units permit him to stack to the ceiling. Because the sweet Bermudas are so fragile, it has been necessary to spread them out rather than stack them up. Last year, for instance, the experimental room could hold only 15 carloads of onions. This year, by using the new pallets, the room's capacity is nearly tripled.

Texas onion growers are expecting a bumper crop this year. The Productiton and Marketing Administration estimates a crop of 5,592,000 50-pound bags in South Texas alone this year, compared to 3,880,000 in 1952.

Although Texas' onion crop is not one of the state's biggest money makers, it does yield producers an appreciable income.

In 1950, for instance, onion growers in the state earned $5,027,000 from a harvest of 4,483,000 sacks.

Alford's experiment on onion storage actually began last year when he contacted the Refrigeration Research Foundation and asked it to look into the problems of onion storage. The Foundation showed an immediate interest and asked the horticulture staff of Texas A. & M. College to conduct the research.

Subsequent experiments proved conclusively that onions remain in excellent condition over a long period of time under 35-degree temperature and in a relative humidity of 50 per cent. Tests made on onions under these conditions showed loss by rotting to be only 3.65 per cent. Weight loss was only 9 per cent of the original weight. Onions stored in the same temperature, but in a relative humidity of 75 per cent, showed a rot loss of 8 percent.

The less-advanced phases of the experiment involves a process designed to prevent sprouting after the onions have been removed from storage. A graduate student of Texas A & M, Bob Wilson, is conducting this experiment.

Practical Refrigerating Engineer
NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Modern Trends in Insulation Design For Refrigerated Enclosures

A. F. LUSCH
Gen. Mgr., Reilly-Benton Co.
New Orleans, La.

This article gives a short review of the fundamentals involved in good insulation application, followed by a description of the new controversial dry-type wall construction. The author is general manager of a large cold storage insulation firm, approved applicators and wholesale distributors of fibrous and cellular glass insulation, and cork. He indicates that the economics of this type construction are its greatest advantage. Theory behind the use of this dry-wall construction is that any moisture introduced into the insulation by accident or intent, will be drawn to the cold surfaces of the mechanical equipment in the room.

WELL established concepts on efficient and economical performance of insulation in refrigerated enclosures depend on: (1) provision of an adequate vapor barrier on warm side of the insulation; (2) selection of a suitable insulation material in adequate thickness for service temperatures intended; and (3) a good design and a well installed job.

In connection with the foregoing, plant managers or owners are confronted with the problem of economics which, too, is basic. In this connection you would consider **initial cost** of the insulation from the standpoint of the relationship between labor and material, with labor—as we are all aware—being the more critical of the two in today's economy. First consideration then should be given to selection of an economical material which may be easily and rapidly installed.

Operating Cost

Next to consider is **operating cost.** All engineers know that the presence of moisture in insulation very seriously impairs its insulation value and thus the machine load on the refrigeration equipment is increased. It is desirable, therefore, that the design and construction of refrigerated enclosures be such that no gradual and increasing moisture accumulation occurs in the insulation. The insulation material should preferably be of a type that is durable and permanent, one that will not deteriorate in the presence of moisture should condensation occur within the insulation.

Address at meeting of Louisiana Chapter No. 2, N.A.P.R.E., June 10, 1953.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, an educational association.
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Secretary, J. Richard Kelahan
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Condensation

Let us consider at this point the problem of condensation—which, as you know, is based on the principal of vapor movement. We are all aware that warm air will hold a great deal more moisture than cold air and consequently there exists a vapor pressure differential between the refrigerated enclosure and the outside air. Since different pressures tend at all times to equalize themselves, the effect is that moisture laden vapor is forced from the high pressure or warm side to the cold or low pressure side.

If this vapor is not retarded in any way, it will not condense when passing through vapor porous materials. If the passage of this moisture vapor should be retarded by a surface colder than its dew-point temperature, the moisture vapor bunches up against the cold surface in a wall and condenses. In other words, that wall gets wet. Eventually the moisture build-up reaches a point where the wall becomes saturated. The efficiency of the insulation is seriously impaired and the increased load on the refrigerating equipment makes it costly to hold desired temperatures.

Based on the above, a relatively new theory in insulation practice is re-

(Continued on page 43)

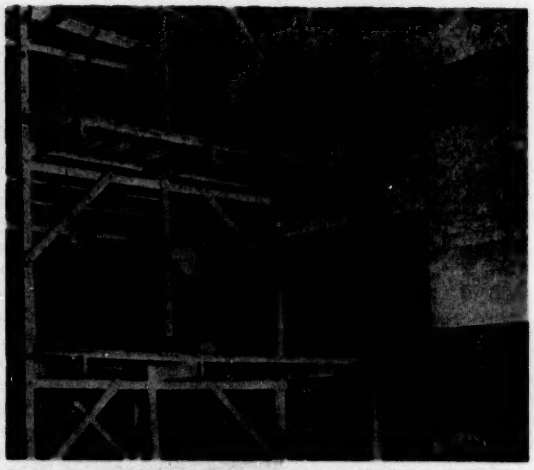

Fig. 1—Perforated tempered hard board, 1/8 of an inch thick, was used as interior finish over Fiberglas insulating boards in the new Leesburg, Fla., cold storage warehouse for Minute Maid. The board is held in place by the bent-over ends of the knife-like clips on which the insulation is impaled. An eight inch thickness of insulation, sandwiched between the masonry walls and hard board finish, helps maintain an interior temperature of 10 degrees below zero. The latest in methods and materials, including 1,235,000 board feet of Fiberglas insulation in the roof and walls, went into the building.

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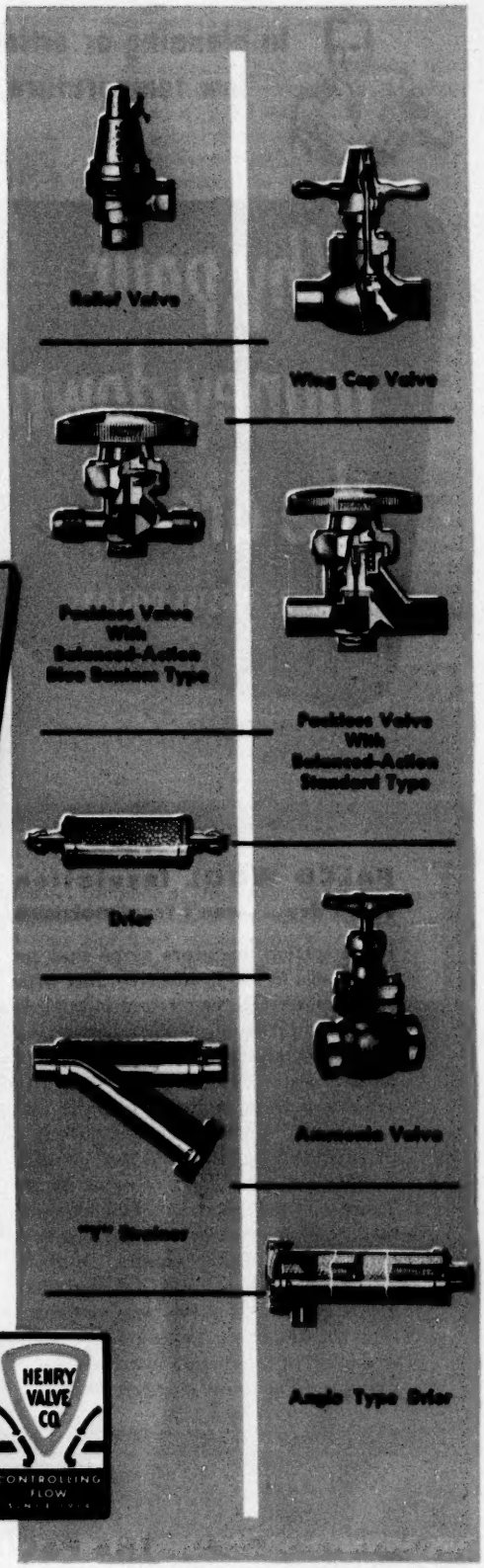

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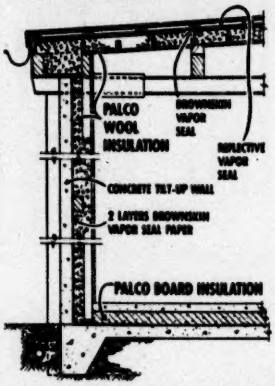

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(Continued from page 40)

ceiving recognition from the cold storage industry. This practice frankly represents a departure from the conventional insulation materials and procedures of erection; and it may be that some will consider they border on the courageous, particularly insofar as real low temperature enclosures are concerned.

Fig. 2—Pictured above is an architect's sketch of one of the largest storage warehouses in the nation which was opened during May in Memphis, Tenn., by the Mid-South Refrigerated Warehouse Company. Covering 2½ acres, the $2,000,000 building has 1,300,000 cubic feet of freezer capacity for fruits, juices, berries, vegetables, meats, eggs and seafoods. The single floor, concrete and steel building was designed by A. Epstein & Sons, Inc., Chicago engineers and architects.

Dry Wall Construction

This method, known as dry wall construction, appears to have considerable economic merit in the larger installations. Larger jobs of this type recently installed include the Hawaiian Pineapple plant at Honolulu, which is the largest pineapple concentrate plant in the world; the new gigantic Minute Maid juice concentrate plant at Leesburg, Florida; the Pasco Packing Company plant, Dade City, Florida, also an orange juice concentrate plant; and more recently the new two million dollar freezer plant at Memphis, Tennessee, for Mid-South Refrigerated Warehouse Co. These plants in Florida and Tennessee alone used in excess of five million board feet of Fiberglas.

The Minute Maid plant in Leesburg, Florida, is constructed of cement block, the one-story building measuring 26 feet from floor to roof slab. Partitions are of red tile, the floor of concrete, and roof of precast vermiculite slabs on bar joists.

To help maintain temperatures of minus 10 F, the building is virtually wrapped in insulation. In the walls, two layers of insulation provide an eight inch thick barrier between the sub-zero interior and the warm outside. Partition walls have three-inch insulation on each side. The 100,000 sq. ft. roof has eight-inch insulation on top of the slab. This was applied with hot asphalt adhesive, which also was used to apply insulation on walls below the filled floor.

An aluminum foil vapor barrier was applied to the masonry walls after first coating the walls with vapor barrier adhesive cement. A substantially perfect vapor barrier is the really first basic essential for dry-type wall construction. The foil is lapped a minimum of 4 inches and the laps sealed with the cement.

Dry Type Application

The new type dry application method was used to adhere insulation to walls of the structure, thus eliminating the need for using hot asphalt as a bonding agent. This dry method saved application time and eliminated on-the-job fire hazards. In this application, the insulation is impaled on knife-like clips which are secured to furring strips on the wall. The two layers of insulation were secured on this set of clips. Wall insulation then was covered with perforated masonite. (See Fig. 1.) This perforated Masonite pro-

Fig. 3—The insulation installed on the roof of the huge cold storage warehouse of the Mid-South Refrigerated Warehouse Co. at Memphis, Tenn., is an effective barrier to sun rays and heat. Contractor's employees are shown above installing the 10 inches of insulation in five layers.

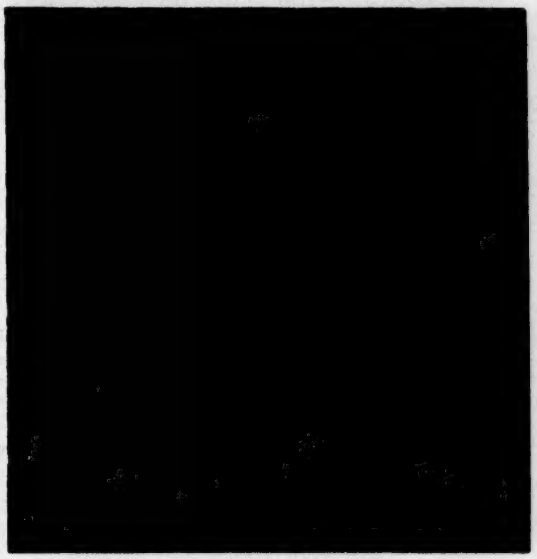


Fig. 4—After Angier brownskin paper was adhered to the concrete sidewalls of the new cold storage warehouse of the Mid South Refrigerated Warehouse Co. in Memphis, Tenn., three layers of 2 by 4-foot low temperature insulating boards were installed to a thickness of eight inches. The insulation then was covered with perforated Masonite panels held in place by Wolmanized treated wood studding. The 1,600,000 board feet of Fiberglas insulation in the floor, walls and roof will help maintain temperature of minus 20F in the new $2,000,000 warehouse. Theory of this drywall construction is that any moisture introduced into the insulation will be drawn through the perforated wall-board to the cold surfaces of the mechanical equipment in the room.

vides a vapor porous cold side finish, which we understand is what good scientific design requires.

The new two million dollar minus 20 F freezer plant recently completed for Mid-South Refrigerated Warehouses Company, (Fig. 2) Memphis, contains this and other new application methods. The roof insulation applied (Fig. 3) is asphalt coated on one side only, the exposed side. This material was in sheet size, 2 x 4 foot, which makes the application economical. The vapor barrier paper applied on the masonry wall, was brought up the wall and over the roof insulation. This was done prior to the application of the built up roofing and this served to envelope the entire building. The rest of the building for the Mid-South group at Memphis is insulated and finished similarly to the Leesburg job.

Angier browskin paper was adhered to the cold inside of the concrete sidewalls as a vapor barrier and dry installation of the insulation was made The 2 x 4 foot insulating boards were installed in 3 layers with the cold or freezer side covered with perforated Masonite panels held in place by Wolmanized treated wood studding (Fig. 4). In the construction, precaution was taken against frost-heave of floors by inserting 8 inch tile on 8 foot centers enclosed in gravel and running crosswise of the building. Hot air may be forced from the engine room through the tile. Thermocouples are located beneath the floor and connected with an indicator in the engine room to show temperatures under the freezer floors.

Pre-Cast Wall Construction

Tilt-up or pre-cast wall construction was used with concrete panels 25 x 27 feet, each weighing 19 tons, poured on the 2½ acre concrete slab floor. The panels, probably the largest yet designed for such construction, were lifted into place by huge cranes. The roof also is concrete prefabrication, supported by steel columns, girders and bar joists. The roof is covered with white marble ships to deflect sun rays and reduce refrigeration needs.

While the Mid-South Refrigerated Warehouse Company is a new concern, its officials are by no means new in the cold storage business. Practically all of them are associated with the Memphis Cold Storage Warehouse Company, the oldest and largest refrigerated warehouse in Memphis before the new construction by Mid-South. William W. Goodman is president of both companies, and T. E. McCrary, an NAPRE member, is vice-president and general manager for the two firms. Charles Conley, past national president, is superintendent engineer for both firms and Alvis Clay, national president this year, is assistant superintendent engineer.

Same Construction in Hawaii

The huge Hawaiian Pineapple plant at Honolulu, the largest pineapple concentrate in the world, utilized the same construction as used at the Minute Maid plant in Leesburg, Fla. Only exception is in the finish. The final layer of insulation for this job was high density material and not the medium density normally used.

This same high density which was used as the finish in this plant is also being used as a form board for pouring gypsum. This unfinished board is exposed in many buildings, including schools, auditoriums and store buildings. This was the first major job, to our knowledge, that utilized no finish over the insulation. The job is going on its fifth year in operation. Wood planking was used as wainscoating five feet up the wall and no additional finish was needed on the exposed insulation above the wainscoating. Insulation was installed between treated wood studs.

News Notes and Chapter Activities

Los Angeles

FRED HERR

CITATIONS of merit from National President Alvis Clay, presented to four members by National Second Vice-president, Regis Gubser, Los Angeles, was the featured event at the annual Old Timer's Night sponsored by Los Angeles chapter at the Terminal Club on June 17. The four men, William Losch, Frick Co., Walter W. Perry, California Consumers Corp., J. Wesley Lamphier, retired, and Enos W. Alderman, retired, were honored for their contributions in behalf of NAPRE for three decades or more.

Mr. Losch joined in Dallas, Tex. in 1921, later transferring to Los Angeles, where he served as chairman of the finance committee for many years. During his entire membership, Mr. Losch has been with Frick, presently serving the firm as Southern California manager.

The chapter's only charter member still on the rolls, Mr. Lamphier, joined in 1922. His activity in the refrigeration industry dates to the turn of the century, joining American Ice Company, Los Angeles, in 1917. Later he began a 26 year tenure with Terminal Refrigerating Co., Lso Angeles, retiring as chief engineer several years ago.

Mr. Perry, plant manager, California Consumers Corp., Los Angeles, joined NAPRE via San Francisco chapter in 1923. Rising from truck driver through various jobs to his present position, marks a successful career for him.

Membership dating from 1921 marks a prominent career for Mr. Alderman, serving with various refrigeration firms in the midwest and on the Pacific coast. Illness forced him into retirement in 1950 from his activity as a sales engineer in the field, and he is now confined to West View Sanitarium in Los Angeles. Because of his absence at the presentation, Herbert Royden of the Royden Ice Company, a long-time friend of Mr. Alderman's, accepted the citation in his behalf.

A hundred or more members and guests were attracted by the celebration, the chapter's largest crowd of the season. Among them were noted eleven past presidents. These were H. Royden (1928-29), Ed. L. Nelson (1932), E. T. Quinn (1933) Frank R. Elliot (1936), W. R. Burnett, (1940), Regis Bubser (1942), Donald H. Byl (1948), Rudi Kettler (1949), Dale Rycraft, Jr. (1950), George H. Paulick (1951), and Edgar M. Marrs (1952).

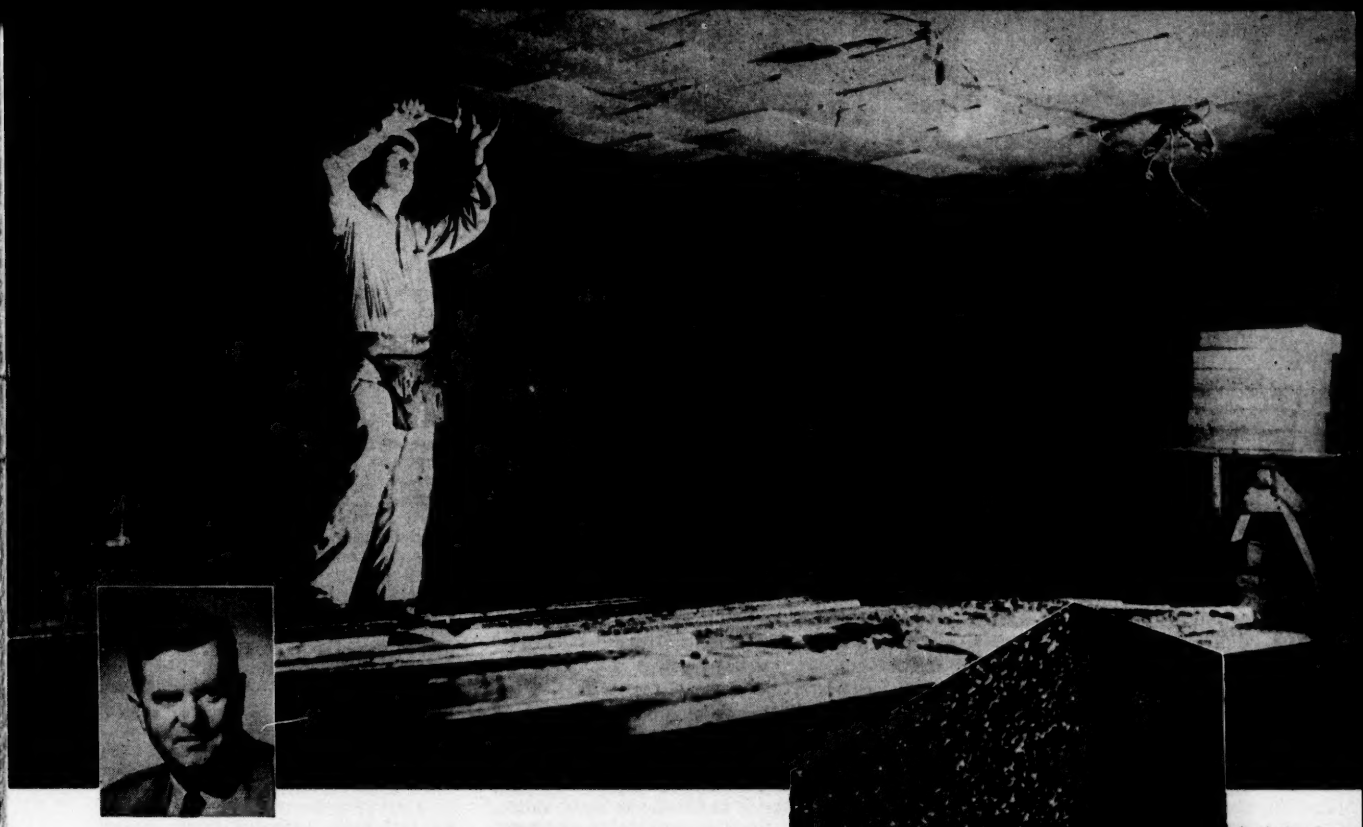
Chairman of the membership committee, W. Ray Burnett, presided over a rally in which he reported results of the drive and presented suitable awards to individual leaders and teams. Don Byl, Union Ice Co., placed first with eight new members, and Mike Julius, California Consumers, placed second with four members. Of 32 new members, the Union Ice Co. team accounted for 14 and the Independents, 18.

Two dozen door prizes ranging from cases of lube oil, sacks of soap to packages of tuna were distributed by E. T. Quinn and W. B. O'Connor, prizes having been donated by various manufacturers and distributors. Elmer Vincent, nationally known TV and radio actor presented a comedy routine as the main entertainment. Ed L. Nelson announced September 16 as the date for the annual Ham-and-Bean Feed.

Colton

HARRY BONTER

SUMMER months bring no relaxation to California chapter No. 5. The July 8 meeting was held in the Santa Fe Ice Plant lunch room, San Bernardino, as scheduled, and the August 12 meeting was converted into a family picnic supper at Devils Canyon in the San Bernardino mountains. Educational instruction by Frank Scherer, was continued on "Basic Refrigeration" by Guy King. The question box discussion brought out the facts that a few of the ice plant offices here are air conditioned by drawing fresh air from outdoors through large pipes which pass through adjacent cold storage rooms. Air conditioning discussion lead to heating the same offices in the winter. It was learned that National Ice and Cold Storage Co. has black iron pipes welded together and laid in a concrete floor of the office, the pipes connected with a low voltage transformer. Current passing through the pipes generates sufficient heat to keep the floor at an even temperature all winter.



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Memphis

CHARLES CONLEY

VERY hot weather did not cut into attendance at the July meeting of Tennessee Chapter No. 1. The education sessions had been suspended for the summer months, but business meetings and the question box are being carried on. Questions and discussions centered around maximum production of ice and loss of revenue from usual freezing of fresh fruits and vegetables, due to the drought.

San Francisco

LEWIS BROOKS

THE June 10 meeting was a double-barrelled education feature on staged refrigeration systems. The instructor, Don C. Bryant, opened the educational session by lecturing on the advantages of staged systems and accomplishing such arrangements. He was followed by the speaker of the evening, Robert B. Holland, a member of California Chapter No. 1. Bob is a manufacturer's representative for Acme Industries, Kramer-Trenton Co., and FES Fuller Rotary Compressor Co.

The San Francisco Chapter was saddened by the passing of Emile J. Etienne who died July 13, 1953 at the age of 72. Emile was one of the pioneer refrigeration men in this territory. He was connected with Cyclops Iron Works from early boyhood. He was well liked and favorably known as an engineer and salesman in California and Nevada. He was responsible in a great way in the organizing of the California Chapter No. 1 of NAPRE and was a charter member. He was born in and spent most of his life in San Francisco. He is survived by his wife, Mrs. Ida Etienne and two sons, Jacques and Robert.

Rio Grande Valley

ARMIN DONEIS

AT THE June meeting, instructor John Muller continued the education sessions with discussions on types of evaporators, their design and operation, using Guy King's textbook, "Basic Refrigeration." During the question box session, Angus Casberg brought up a proposed modernization project for his plant. This alteration would provide semi-automatic operation for one of his ice tanks, bringing about more economical operation by providing fully flooded coils, a revised system of headers, a larger accumulator and electronic float controls. Considerable comment and discussion of the proposal provided an opportunity for members present to benefit by the exchange of ideas.

Dallas

CECIL TAYLOR

THIS Texas chapter has recessed for the summer months. However, we can report that one of our distinguished members, L. P. Reiss, has sent correspondence from Philmont Scout Ranch at Cimarron, New Mexico. Mr. Reiss, a consulting engineer and past president of Southwestern Ice Manufacturer's Association, is acting as postmaster for the ranch. The ranch is located along the old Santa Fe trail in what is known as Kit Carson land. Mr. Reiss expects to return to Dallas in time for the fall meetings.

Seattle

JAMES BENNETT

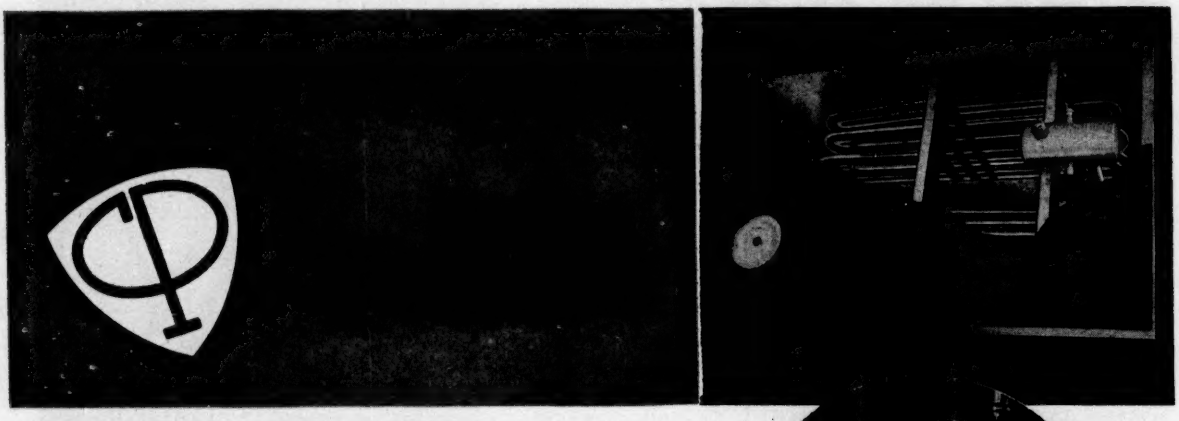
AS IS customary, Washington chapter No. 1 adjourned for the summer months. However, to keep contact with the members we have a monthly newsletter, providing them with both local and national news, and an annual family picnic. This year the picnic was held on Sunday, July 12 at Five Mile Lake between Seattle and Tacoma. The Tacoma chapter joined in the usual picnic pastimes. Coffee and ice cream was furnished by Fred Cornford, chief engineer, Arden Farms. Beverages were furnished by Rainier Ice and Cold Storage.

Seattle chapter was happy to receive an application for membership from Alfred R. Larson, engineer, Carnation Co. Al is the first member in this chapter from the Carnation organization. Louis J. Beriault is now engineering at the new multi-million dollar Childrens Orthopedic Hospital.

Yakima

ELMER TOOP

THE Yakima chapter lost a valued member, Edmund Allard who died on July 12 at forty-two years of age. He had been suffering from cancer for the past four years, but continued in his capacity with the Pacific Power and Light Co. until two months ago.



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Members-at-Large

LEO VIVIEN

OUR members-at-large keep the national office busy every month with various requests. Some heard from most recently were R. J. Slessar of R. Weiner & Co., Pty., Ltd., Victoria, W. G. Cropper and T. Andrew of Cropper Andrew Pty. Ltd., Sydney, Australia. Other foreign members-at-large writing in were Nathan Feldman, Haifa, Israel; George Westendorp, Mexico; Robert B. Brown, Caracus, Venezuela; Francisco Fernandez, Havana, Cuba. Mr. Fernandez is a new member, having just been admitted to membership by the Board of Directors. Another new member is J. Gonzalez Prieta of San Juan, Porto Rico. Also heard from was E. A. Cruise, Vancouver, British Columbia, Canada.

Two members recently corrosponded from Hawaii: Cameron W. Deal, Lanikai, and Walt E. Wilkinson, Honolulu. Alaska also came in with letters from Herman W. Buskirk and Frank D. Montgomery.

Most of the states were represented in recent correspondence: Charles E. Smith, Council Bluffs, Iowa, Chester George, Wyoming, Robert F. Jones, Utah, and Floyd E. Dale, North Platte, Nebr., sent their annual remittances.

Others forwarding dues were John H. Glenn and George Large, Glenn Ice and Fuel Co., Beardstown, Ill.; Hubert B. Brannan, a national Director, with Pacific Fruit Express, Pocatello, Idaho; Carl J. Nesler Jr., Artesian Ice & Cold Storage Co., Texas City, Texas; and P. G. Melhus at Fargo, N. D., who writes from his hospital bed. Other members dropping a line were Blair A. Funkhauser, Crozet Cold Storage Corp., Crozet, Va., and Gus L. Beinert, Mutual Ice Co., Alexandria, Va; Fletcher Kysar, Railways Ice & Service Co., Waynoka, Okla.; S. Milt Rambo, Consumers Ice and Packing Co., Lancaster; Walt K. Schneider, Tengan Ice Plant, Huntington, L. I., N. Y.; R. Foster, Lynbrook, N. Y.; Carl Behning, National Cold Storage and Warehouse Co., Duluth, and Telbert Cutting, of Winnebago, Minn., who sent in a paper on frozen food plant problems.

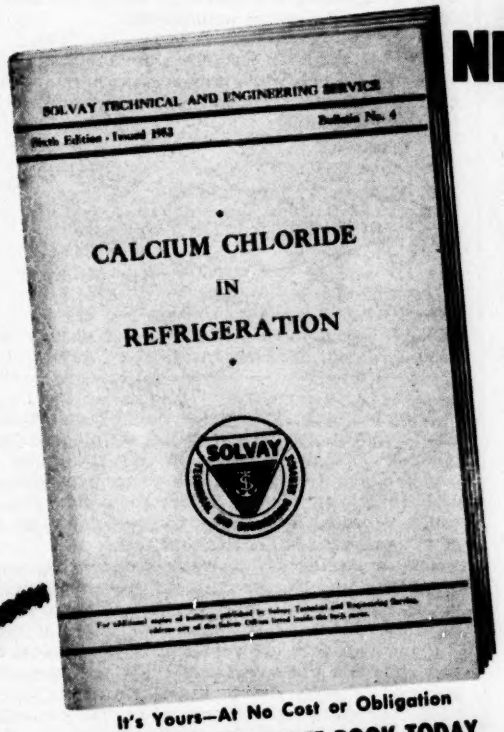
NAPRE Operating Data Book for 1953 Published

THE 1953 Operating Data Book, published annually by NAPRE, made its appearance in early August. Like the twelve preceeding issues, it features verbatim reports of the 43rd annual convention papers, with illustrations. This is the largest data book to date, with 144 pages. New items include editorials, lists of national and chapter officers, an enlarged buyers directory, and tear out post-paid, self-addressed post cards for readers use in contacting advertisers and authors. The question box, also retained, is much enlarged.

Chapter Membership Quotas

THE assignment of chapter quotas by George H. Whitman, national membership chairman, was made during the summer months. California chapter No. 6 at Fresno has no cancellations or suspensions this year. Washington chapter No. 2 at Tacoma is running a close second and only one suspension. Chicago chapter sets a pace for percentage increase having exceeded its quota. As usual, Los Angeles and New Orleans are neck and neck in the number of new members obtained.

Competition is for three trophies; one, the largest and handsomest, is the Emerson A. Brandt Memorial Membership Trophy. It is held by Louisiana chapter No. 2 and awarded annually by the Board of Directors to the chapter distinguishing itself in membership activity. The other two trophies are awarded on the basis of (1) largest percentage increase and (2) for the largest increase in number of members. Tulsa holds the percentage trophy and New Orleans holds the numbers increase award. New Orleans has two legs on the latter. Renewal of memberships counts heavily in all contests.



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NAPRE
Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

Correction

ANSWERS to Questions 961 and 962 in the August issue were transposed. Answer to Question 961 as it apactually belongs with Question 962 and vica versa.

By-Passing of Back-Pressure Valves

QUESTION: No. 961: When we enlarged our ice plant in the winter of 1937 we purchased a new 8 x 8 inch compressor, a water pre-cooler, a flash type ammonia liquid cooler, and two back pressure valves. We were instructed to use the back pressure valves on the ammonia and water coolers, and hook all suction lines together into the other three compressors—one York, 9 x 9 inch at 175 rpm, one York 9 x 9 inch at 237 rpm and one Frick 10 x 10 inch at 300 rpm. I did not follow instructions, but bypassed the back pressure valves, and instead of connecting the coils of the ammonia and water coolers into the same line with all of the compressors, I connected them into the suction line of the 8 x 8 inch compressor and operated them at high back pressure without the use of the back pressure valves. Was I right or wrong?—M.J.

ANSWER: The 8 x 8 compressor when operating at 237 rpm and 185 psig head pressure has normal performance characteristics at various suction pressures as shown in the following table:

Suction psig	Suction temp. F	Tons Refrigeration	B.H.P.	B.H.P. Per Ton
15	-1	22.5	36.7	1.63
20	5.5	26.6	38.9	1.46
25	11.3	30.7	40.4	1.31
30	16.6	34.8	41.5	1.19
35	21.4	39.0	42.4	1.08
40	25.8	43.1	43.2	1.00
45	30.0	47.5	43.7	0.92

From this table it may be seen why it paid to operate the 8 x 8 compressor independently of the others at the highest possible back pressure. At 45 psig the water could be cooled to about 40 degrees at a power expenditure of only 0.92 B.H.P. per ton, and at the same time the ammonia could be cooled in a flash type precooler to 30 degrees F or in a coil type cooler to about 40 F.

The precooling of the water reduced the load on the brine tank, and the precooling of the ammonia gave each pound about 75 Btu (15 per cent) additional refrigerating capacity.

If the back pressure valves had been used on the water and ammonia precoolers and the 8 x 8 compressor had operated in parallel with the others at 15 psig it would have produced only 22.5 tons additional capacity instead of 47.5 and the brake horsepower per ton would not have improved. As it was the plant output was increased about 13 percent and the Kilowatt consumption per ton of ice was reduced about 8 per cent during the peak load.—H.G.V.

Quick Freezing Turkeys

QUESTION No. 963: We are building a blast freezer tunnel for quick freezing eviscerated turkeys at a desired room temperature of -45 to -50 F. We have two vertical ammonia compressors with displacements of 153.4 and 134.6 cfm respectively, and one rotary booster having a displacement of 659 cfm. We contemplate using two air units each having 8000 square feet of fin coil surface, and each having a blower of 25,000 cfm capacity. The coils will be made up of ¾ inch steel tubing—3 fins per inch. They will be flooded at all times by means of a liquid recirculating system. (1) We would like to have the ratings of the booster compressor at -55 F and -60 F evaporating temperatures and at 15 and 20 psig. discharge pressures. (2) We would like to have the ratings of the vertical compressors at 15 and 20 psig suction pressures and at 155 and 175 psig discharge pressures. (3) We would like to know whether in your opinion the two air units will be adequate to take care of the load.—W.H.J.

ANSWER: The capacities of the booster compressor and lbs. per min. handled as shown in Table 1. are based upon the liquid being cooled in a cooler from either 93F (175 psig) or 86.2F (155 psig) to 10F or 16F before being throttled into the expansion coils.

TABLE 1. PERFORMANCE OF 659 CFM BOOSTER

Evaporating Temp.	Pres. Hg.	Discharge psig	Tons Ref.	Lbs. NH_3 Per Min.
-55F	-16.6	15	33.6	12.06
-55F	-16.6	20	32.2	11.72
-60F	-18.6	15	27.3	9.85
-60F	-18.6	20	26.1	9.46

The capacities of the second stage compressors as shown in Tables 2 and 3 are based upon the ammonia gas entering the cylinders at 10 or 16 degrees respectively. This allows approximately 10 degrees of superheat between coils and compressor.

TABLE 2. PERFORMANCE OF 153.4 CFM COMPRESSOR

Suction Temp.	psig	Discharge psig	Tons Ref.	Lbs. NH_3 Per. Min.
10F	15	155	31.3	13.24
10F	15	175	29.9	12.87
16F	20	155	36.8	15.48
16F	20	175	35.7	15.42

TABLE 3. PERFORMANCE OF 134.6 CFM COMPRESSOR

Suction Temp.	psig	Discharge psig	Tons Ref.	Lbs. NH_3 Per Min.
10F	15	155	27.5	11.70
10F	15	175	26.3	11.26
16F	20	155	32.3	13.56
16F	20	175	31.4	13.52

The second stage compressors will balance the output of the booster when it will handle the weight of gas (lbs. per min.) delivered by the booster plus about 25 percent required in the inter-cooler.

Example: Assume that the booster output is 33.6 tons refrigeration or 12.06 lbs. per min. at -55F and 15 psig. The second stage must handle 12.06 plus 25 per cent or 15.07 lbs. per min. at 15 psig suction. Neither of the two compressors will handle that much gas at 15 psig. So you will either have to reduce the weight pumped by the booster by reducing its load, or use both compressors part of the time.

Again assuming the booster load is 33.6 tons refrigeration and that the two fans have a total capacity of 50,000 cfm the air must be cooled about 5.71 degrees while passing through the coils, derived as follows:

$33.6 \times 200 = w\ (t_2 - t_1)\ .24$

where w is lbs. of -45F air per min.

w is found by the use of the gas law equation,

$144\ pV = wRT.$

p = pressure in lb. per sq. in. absolute.

V = volume in cubic feet per min.

R = gas constant for air, 53.3.

T = Absolute Temperature, (460 — 45)

(Continued on page 53)

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Kenagy Chief Engineer for Railways Ice & Service Co.

NEW chief engineer for Railways Ice & Service Co., is Leland Kenagy, it was announced on August 15 by Frank D. King, vice-president and general manager. Kenagy moves from his present firm, The Newton Ice Co., as general manager, to the Kansas City offices of Railways Ice effective immediately. He succeeds A. R. Carlson, who became vice-president in charge of engineering for the Southeastern Public Service Co. and its subsidiaries.

Leland Kenagy

Leland Kenagy was born in Garden City, Mo. and came to the ice industry in 1930 with Newton Ice as a plant engineer. He succeeded the chief engineer in 1943 and became general manager of the firm in 1951. Kenagy, an active member of NAPRE since 1932, is national treasurer of the Association in which office he has served since 1946. He is also a member of the National Association of Power Engineers. He received his technical training at Finley Engineering College, Kansas City, Mo., and has continued extension work in electrical engineering and personnel management since that time.

Frozen Baked Goods

OREGON Agriculture Experimental Station has reported that frozen chocolate cakes containing some butter were superior in experimental tests to those made with lard or vegetable shortening alone. The most satisfactory frozen chocolate cakes were those made with a combination of butter and vegetable shortening of special recipes for frozen products. The tests showed that four months at 0°F is a maximum for chocolate cakes and that the limiting factor is development of a crumbly texture. Butter, as well as lard, cakes acquired a rancid flavor if held as long as six months.

Mutual Security Agency Awards Certificate to NAPRE

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Deputy Director for Mutual Security

Certificate awarded NAPRE by the Mutual Security Agency, for technical assistance in refrigeration furnished representatives of Australia, France, India, West Germany and Thailand. NAPRE instructed these visitors on objectives of the association, showing them mutual gains derived through education and exchange of ideas in chapter meetings and national conventions. Professor H. G. Venemann handled the instruction phases of these government sponsored tours. Plant tours were arranged through the National Secretary with the help of Past President A. R. Carlson and National Director Bert McKenna.

NAPRE Plans For Annual Convention

ALTHOUGH most chapters have been recessed for the summer, NAPRE national committees have been moving right along on convention plans. S. Averill Cole, chairman, publicity and public relations, has released a bulletin to the members picturing the convention guest of honor, Professor H. G. Venemann. The annual meeting will be held at Purdue University on November 10-13, 1953.

Bert C. McKenna, a national director and president of the Chicago chapter, has been appointed general convention chairman by Alvis J. Clay, president, and assigned 'the task of coordinating all committee details with those of the Purdue officials. Mr. McKenna persuaded the Chicago chapter to act as hosts at the annual banquet. Chicago is busy planning a prebanquet cocktail party, and music, dancing and entertainment after the dinner. The only expense of this affair for a convention delegate or guest will be the meal. The affair will be off the Purdue campus.

Mrs. H. G. Venemann has been appointed chairlady for the ladies committee. President Clay has established a precedent this year with the ladies planning their own activities. Suggestions are invited from the wives of all members. Wives of past presidents, or the wives of the president or secretary of a chapter which has no past president in its ranks, will serve on the committee with Mrs. Venemann.

Although being guest of honor, Professor Venemann has his work assigned, too. As chairman of the National Educational Committee he is responsible for the speakers. Professors Wm. T. Miller, C. S. Sprague, A. R. Spalding and Dr. I. Walerstein, Purdue, have accepted invitations to appear. Professor Harold P. Hayes, Dean of Engineering, California State Polytechnic College, will deliver a paper on the latest developments in vacuum cooling of produce. Walter E. Bernd, supervising engineer, Terminal Refrigerating and Warehouse Co., Washington, D. C., a past president, will deliver a talk on some new cooling tower applications, on which he has collaborated with Fred Ophuls, well known consultant on refrigeration. E. T. Quinn, another past president, Los Angeles, and C. Tom Baker, of Savannah, Ga., will also deliver talks.

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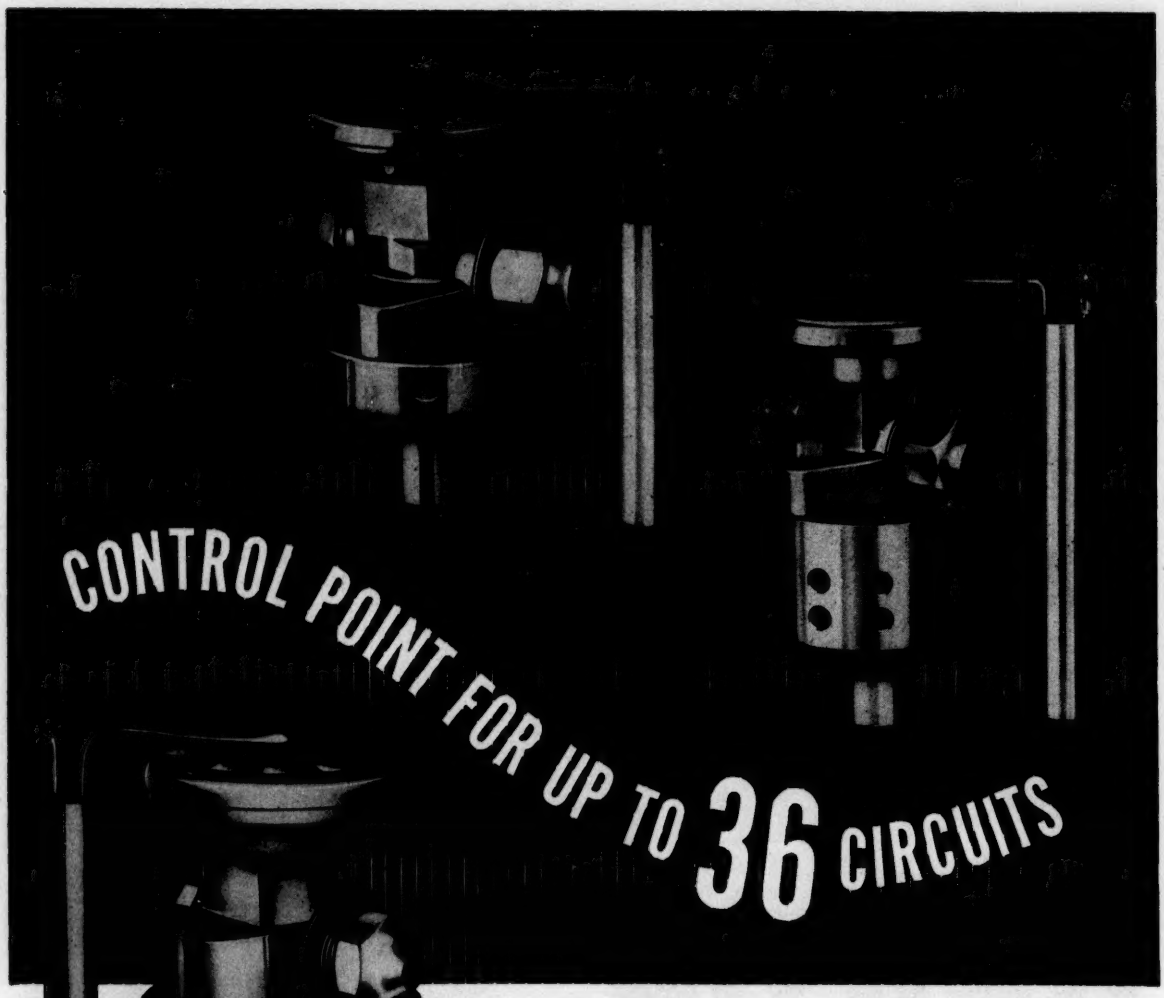

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(Continued from page 49)

$$w = \frac{144 \times 14.7 \times 50{,}000}{53.3 \times 405} = 4900$$

Substituting the value of w in the original equation we solve for $(t_2 - t_1)$.

$$(t_2 - t_1) = \frac{33.6 \times 200}{4900 \times .24} = 5.71F$$

The overall heat transfer value, U, of the 16000 sq. ft. of in Btu per hour, sq. ft., degree F will have to be

$$U = \frac{33.6 \times 12000}{16000 \times 9.6} = 2.6$$

I seriously question whether the coils with so much fin surface will be able to transfer heat at that high a rate. Unfortunately, I do not have the manufacturers ratings on the fin coils, so would not care to say definitely what they will do.

It is my opinion, however, that you will not be able to get the maximum capacity of 33.6 tons out of the booster compressor because of the shortage in capacity of the coils. I suggest that you have the coil manufacturer check this carefully.—H. G. Venemann.

Mercury Column Manometers

QUESTION No. 964: The relative safety of Mercury Column Suction Gauges was brought up for discussion because several members had heard or read about disastrous explosions attributed to such gauges. Any reliable information as to the cause and effect, and the chemical reaction created by the combination of mercury and ammonia or lubricating oil would be helpful to us.—A.F.D.

ANSWER: This question was answered in the September 1949 issue of ICE AND REFRIGERATION and in the 1950 Operating Data Book, page 63, as follows:

"I have discussed this question with Prof. G. B. Bachmann, one of Purdue's eminent chemists with particular experience in explosives, who assures me that there is no normal reaction between ammonia and mercury that would produce an explosive mixture. He suggested that if any reaction did occur due to the presence of oil or other impurities, the mercury would turn dark at the meniscus, thus warning that it was time to clean the manometer."

In addition to the above statement, let me point out that all test codes recommend the use of mercury manometers for determining suction pressures.—H.G.V.

New Questions

Electric Motor "Kick-Back"

QUESTION No. 965: Recently I was called to replace a motor on a milk cooler. The motor I took off was a ⅓ Delco capicator start. This motor had 6.4 amp. fusestat (or fusestron) in the fuse box. The fuse had done its duty, the small spring in it had contracted and broken the circuit. Later on at the motor shop the motor was said to have had a broken wire.

The fuse, as I shall call it, when it blew must have arced and burned a hole in the brass threaded casing in the fuse box. This hole could be plainly seen without removing the fuse. (a) What could have caused this? It is a new wiring job, passed by inspectors and the electrician said it was caused by a *kick back* of power. He says it is common in 440 volts. (b) I wonder if you could give me an idea as to what "kick back" is, and what causes it?

Lightning Protection

QUESTION No. 966: Lightning destroyed a stator coil on one of my 2300 v., 257 rpm, 200 hp, 3 ph, engine-type synchronous motor. This is the third time one of my motors has been damaged in this manner.

My plant is protected by arresters on the power supply lines at the entrance to my building. The power company substation and tower are 300 feet from this point of my plant. For about a third of this distance, the lines run at the side of my building, hung on A-brackets. Each time,

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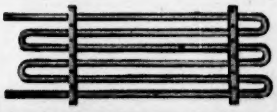

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the lightning has struck the bracket farthest from the arresters. Each time, the motor repairs have been approximately 3,000 dollars.

Why don't the arresters satisfactorily ground lightning and protect the motor? Do I have to cease plant operations each time an electrical storm comes up?—R.W.S.

Fusible Plug

QUESTION No. 967: May I use the same fusible plug in an unfired pressure vessel in a Freon 22 system as I would use for Freon 12?—A.B.C.

Denmark and France Representatives Study Late Refrigeration Methods

REFRIGERATION methods used in the United States soon will be aiding Denmark and France as a result of a Mutual Security Agency sponsored study in this country. Refrigeration engineers, research specialists, consultants, manufacturers, retailers, packers and home economists from the two European countries visited leading plants in the country in gathering and exchanging information about refrigeration.

Typical of other stops on their itinerary, 19 members of the touring group met at the plant of Continental Freezers of Illinois, Inc., 4220 S. Kildare Avenue, Chicago. Following a complete tour of the plant, conducted by Kenneth F. Stepleton, president, luncheon was served at the Central Manufacturing District Club. To explain the latest equipment and handling methods used in this new cold storage warehouse as well as the distribution of frozen foods in transit and the design of the building, a corps of 14 men was on hand.

In addition to Mr. Stepleton, others were: Jack Hemery, treasurer, Earl Thornton, assistant general manager, and Gene Closson, traffic manager, of Continental Freezers; A. Epstein, Maurice Fine and Charles Pick of A. Epstein & Sons, Inc., architects and engineers for the building; Don Parkhurst of Burge Ice Machine Co.; Roy Reusch of Jewel Tea Co.; Adolph Ernst, William McNamara and Lester Schlink of the Great Atlantic & Pacific Tea Co., Prof. William Hagen and his son, William, of the Chicago Stock Yards Turbo Refrigeration Co., of which Prof. Hagen is vice-president.

Since 1947 France has attempted to develop a refrigeration network and construct necessary facilities. A considerable amount of progress has already been achieved particularly in respect to storage installations in fruit packing plants, cheese manufacturing plants and wineries.

In 1950, individuals from France known as the OEEC-17 Cold Chain visited the United States for three months. Many of the practices they saw and recommendations made to them have now been put into practice. This study now is being directed toward the solving of those weak aspects which still exist and to which the men in this group are directing their attention.

Technical consultant for the tour was Thomas B. Atkins, U. S. Dept. of Agriculture Production and Marketing Administration.

Army Buys More Butter

MORE butter is being sold to the Army by the United States Department of Agriculture. The latest purchase amounted to 871,812 pounds, bringing the total up to 1,967,409.

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International Institute Commissions Meet

THE study of various problems relating to the applications of refrigeration was carried on during important meetings held in Mons, Belgium and Wageningen, The Netherlands by three commissions of the International Institute of Refrigeration, namely: Commission 3 (design, construction and operation of machinery for refrigerating and air-conditioning plants), presided over by Professor Glansdorff Belgium; Commission 4 (applications of refrigeration to foodstuffs and agricultural produce), presided over by Dr. Fidler, Great Britain; Commission 5 (cold stores and ice-making plants), presided over by Ing. Fontanel, France.

The qualified experts presented scientific and technical papers bringing forth new ideas on (1) the construction of compressors; (2) relative humidity and dehydration of foodstuffs in cold stores; (3) present methods for the making and delivery of ice; (4) the cold storage of fruit and more particularly, gas storage.

Commission 3 decided to draw up an international test code with a view to making uniform and comparable the testing of capacity and efficiency of the refrigerating machines manufactured in the different countries. A subcommission directed by Professor Plank, Germany has been entrusted with this work. In the same manner, an international safety code for refrigerating machines will be prepared by a sub-commission directed by Col. Randal Steward, Great Britain.

On the other hand, Commission 5 will endeavor to unify the bases of calculation of cold storage tariffs as well as the storage regulations in order to facilitate the international trade of foodstuffs.

Commission 4 decided to co-ordinate scientific research relating to the applications of refrigeration to perishable foodstuffs. Without limiting the autonomy of the various national laboratories and research stations and by assuring permanent contacts, this commission will point out to such laboratories the research being made and the research desirable to be made.

Western Regional Frozen Food Convention

FROZEN food sales and marketing will be the theme of the First Annual Western Regional Frozen Food Convention, to be held in San Francisco on October 11, 12 and 13, it is announced by President Paul Ciampi of the Frozen Food Distributors Association of California, which organization will sponsor the event. All segments of the frozen food industry in the Pacific Slope states will be invited to attend the convention, for which a program is being drawn up by a special committee which includes distributor, packer and broker representatives.

Alvin Langfield, former president of the National Wholesale Frozen Food Distributors Association of Oakland, California, will be convention chairman. Everyone in the West connected in any way with the frozen food industry is invited by Chairman Langfield to attend the convention.

All sessions of the convention will be held at the Palace Hotel in San Francisco.

Apple Convention

THE fifty-ninth annual apple convention of the International Apple Association will be held at the Sherman Hotel, Chicago, October 10-13. As the "Fruit Convention of the Year," it is expected to attract a record crowd, including NARW officials who will be special guests.

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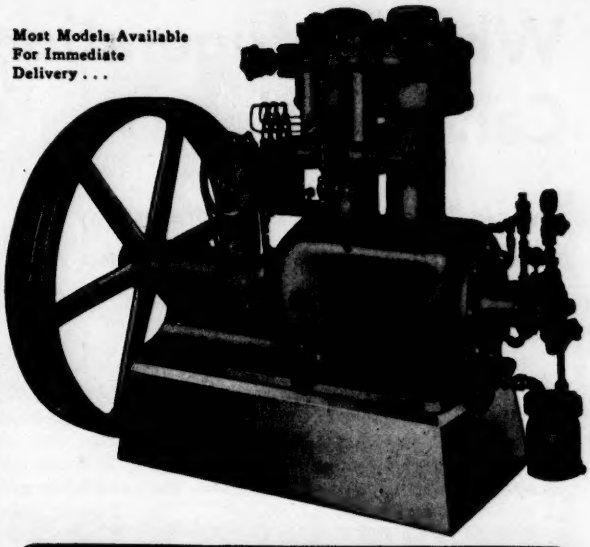

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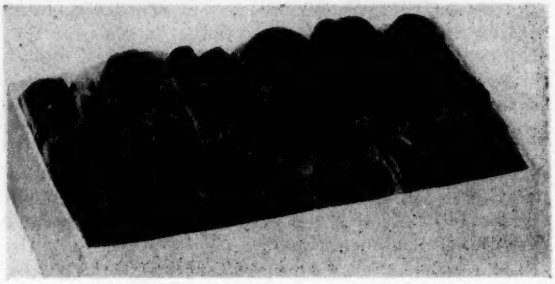
What Refrigeration Means To the Candy Industry

Technical developments in the candy industry come from research, in which Refrigeration has an important role



A RECENT Bulletin to candy manufacturers by Philip P. Gott, president of the National Confectioners' Association called attention to technical developments in the candy industry stemming from research carried on principally by the Georgia Agricultural Experiment Station, directed by Dr. J. G. Woodroof.

At a Southwestern Regional meeting of NCA held at the Georgia Experiment Station May 5, reports were presented on a number of technical subjects of direct interest to candy manufacturers.

Sugar Bloom

E. K. Heaton, food technologist, Georgia Experiment Station, made a progress report on the study of sugar bloom on assorted boxed candies from five manufacturers. Seventy-two boxes of each of the candies were sent to the station and placed on test under widely different temperature and relative humidity conditions.

Mr. Heaton reported that the occurrence of sugar bloom was amazingly light, and no blooming occurred even when the boxes of candy were removed directly from 0 to 70 F and 85 percent relative humidity, if the overwrapped box remained unopened until the temperature of the candy had equalized with that of the atmosphere; this required about four hours. Overwrapping boxes with either aluminum foil, cellophane, Saran, or polyethylene prevented sugar bloom entirely when the boxes remained closed until they had reached room temperature.

The kind of innerliner used in boxed candies was important. The same materials which proved most satisfactory for overwrapping boxes were also most satisfactory for use as innerliners.

Cracking of Candy

The questiton of candy's cracking when cooled down and stored at 0 F. was raised by Dr. L. F. Martin, Bureau of Agricultural and Industrial Chemistry, Head Agricultural Chemical Research Division, U. S. Department of Agriculture, New Orleans, Louisiana, who said, "A microscopic study of Brazil nuts at room temperature and again when they had reached their freezing point, showed that less than 10 percent reached the freezing point without cracking." Mr. Heaton said difficulty had been encountered, particularly with Brazil nuts, also candies with honeycomb centers.

Pecans

A report on pecans was presented by Dr. Woodruff and Mr. Heaton, based on research sponsored in part by The Refrigeration Research Foundation.

If pecans are to be held after the first of April, it is necessary to keep them in refrigerated storage. They must be stored under refrigeration much earlier if a year-round supply is to be maintained, especially if they are shelled.

This report published in the July ICE AND REFRIGERATION, makes four recommendations: Inspect pecans before storage; Maintain relative humidity from 65 to 70 percent; Maintain temperature from 28 to 38 F; Store pecans alone or only with other dry, odor-free products.

Peanuts

There are three main reasons for poor quality peanuts according to N. M. Penny of the Georgia Experiment Station:

First, poor harvesting practices, less careful hand-stacking, more slip-shod hand-stacking, and an increase in the amount of peanuts harvested mechanically.

The second reason is weather and diseases. Diseases are controlled to some extent but apparently the disease problem relative to concealed damage is increasing.

The third reason for poor quality is related to conditions under which peanuts are marketed at the country buying points. Most of the facilities are common type warehouses originally constructed for other purposes. Improved storage facilities would make the control of insects and rodents easier and less expensive.

An article on storage of peanuts by Dr. Woodruff was published in the August ICE AND REFRIGERATION.

Extending Shelf-Life

A report on extending candy shelf-life, prepared by E. K. Heaton and J. G. Woodruff, made the point that adequate refrigeration is an important phase.

As shown in recent experiments, they said storage temperature was more important in retention of candy quality than a humectant or antioxidant, and it was equally as important as the type of package.

After six months at 32 F. there were practically no changes in eating quality or moisture content of any of the candies. There was slight cracking of coatings on the chocolate-fudge bars, dulling of the finish of caramel-nougat and slight sweating of gum drops.

At 70 F, chocolate coated peanut bars, coconut bars packed in plain cartons were poor in quality. At 70 F three weeks and alternating 100 F one week with a few exceptions, all candies were adversely affected in appearance.

Storage Facilities

According to a survey made by Dr. Woodroof and published in the October 1952 ICE AND REFRIGERATION, the refrigerated warehousing industry had available space for storing under refrigeration 13,350,000 pounds of candy. This report also gave detailed information on storage temperatures and humidities.

Candy Chemistry

An article in Chemical and Engineering News, November 3, 1952 states that candy is quickly affected by temperature and humidity, and several kinds of deterioration in chocolate, hard, and marshmallow candies not only cause a heavy loss to the industry but also result in considerable consumer dissatisfaction.

186,072,500 pounds of Tube-Ice used in building 2 WESTERN DAMS*

Yes—that much ice was required to cool the concrete mix in order that it set properly to develop its ultimate strength for two outstanding dam structures.

The important part of this message to you is that the compact and readily portable Vogt Tube-Ice Machines pictured here set this record without even the replacement of a freezer tube. What's more, they are *ready to go again* whenever ice is needed in quantity.

Tube-Ice is widely used in process work and for preserving shipments of meat, fish, milk or vegetables... and is produced at the lowest possible cost per ton since a Tube-Ice unit occupies less space, has fewer parts, uses less power than any other method for making ice.

Tube-Ice Machines are available in sizes from 2000 lbs. per day up to any desired capacity. Send for free Bulletin TI-3.

**McNary Dam, Washington, and Pine Flats Dam, California, required a total of 2,730,000 cu. yds. of ice cooled concrete mix.*

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New DRY TAMP PERMA Mix Floor Patch

Permamix-C for patching in temperatures from 5° above to 30° below zero.

DRY TAMP MEANS SPEED • No sticky mass to dig out of the drum or to handle • Permamix dry pours • sets instantly • feather edges perfectly • no production delays • non-skid surface.

ALL TEMPERATURE • Won't freeze • can be stored or used in *any* temperature • will store indefinitely • a stock room item • will not "set" in drum whether open or covered. Mistakes just can't happen. Tamp in place and traffic rolls.

CUTS MAINTENANCE COSTS on concrete, brick, tile or asphalt floors • no special equipment or skill needed • a one man job • comes in durable 50 lb. net wt. fibre drums • solve your floor patching problems for good.

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3-WAY DUAL SHUT-OFF VALVE

For use where Refrigeration Codes require dual relief valve installations. Stainless steel stem. Indicator plate on hand wheel shows position of valve shut off. Completely rust-proofed.

RELIEF VALVES

For Ammonia and Freon. One piece body design—rustproof finish. Internal construction—stainless steel—will not corrode. Positive relief action. Pressures from 75 to 400 lbs.

See your jobber—or write us for prices.

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Circle No. 32 on Reader Service Card

Southern Texas Service Leases 35 Ice Plants

THE Central Power & Light Company leased its 35 ice plants to Southern Texas Ice & Service, Inc., August 1, 1953. The new company is a subsidiary of Southeastern Public Service Company which numbers among its other ice and cold storage operating properties, Royal Palm Ice Company in Florida, Railways Ice & Service Company which operates in seven midwestern and western states, Albuquerque Ice Company in Albuquerque, New Mexico, and Grants Ice Company in Grants, New Mexico.

Mr. Gregory, president of Southeastern has announced that the headquarters of the new organization will remain in Corpus Christi with E. W. Franke as vice-president and general manager, R. A. O'Neill, vice president-engineering and David E. Brown, assistant secretary in charge of accounting.

Mr. Gregory welcomes the opportunity of having his company serve the ice users of Southern Texas and expresses enthusiasm and confidence on the future of this rich territory.

The properties leased by Southern Texas include the ice plants, docks, vending stations and other equipment located in the lower Rio Grande Valley, Winter Garden, Gulf Guadaloupe Valley and Corpus Christi areas.

The district office for the Valley area will be located in Harlingen and will be under the supervision of J. W. Sweeney.

The district office for the Winter Garden area will be located in Uvalde and will be under the supervision of John Kenyon.

Locker Plants Sell Commercial Packs of Frozen Foods

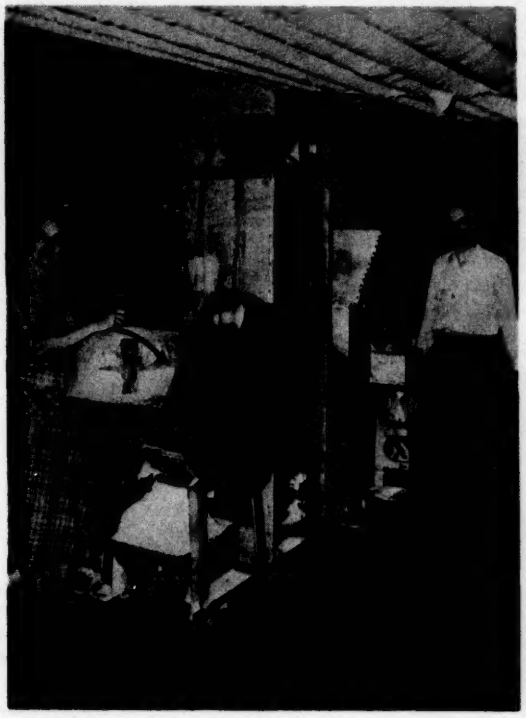
FROZEN food locker plants are becoming important sources of commercial frozen food for their locker patrons, home freezer owners, and others such as stores, institutions, and restaurants, according to a study of 1,350 plants throughout the country by the Farm Credit Administration of USDA. About two-thirds of the locker plants were selling frozen foods.

The percentage was highest in the North Atlantic States, averaging 82 percent, and lowest in the South Central Section, only 54 percent. Although many locker plants sell frozen foods, the sales volume per plant is small, about $8,400 in 1952, with four percent of the plants having sales of more than $50,000. Seventy-two percent of all commercial frozen food is sold at retail to locker patrons, home freezer owners, and other consumers. Twenty-eight percent is sold to stores, institutions, restaurants and others. Many locker plants with unused storage and freezing capacity often become distributing points for commercial frozen foods.

Refrigeration and Air Conditioning Exposition

THE refrigeration and air conditioning exposition to be held at the Cleveland public auditorium November 9 to 12 is expected to attract a number of transportation and warehouse executives. The exposition is sponsored by the Refrigeration Equipment Manufacturers Association and will occupy four halls of the auditorium. Two hundred companies will have exhibits. Hotel reservations may be made through the Housing Bureau, Cleveland Convention Bureau, Terminal Tower, Cleveland, Ohio.

All the Family Helps to Operate This Ice Plant



The Franklin Ice Company at Lynchburg, Va. is operated by Mr. and Mrs. Franklin and their two sons-in-law. Mrs. Franklin whose title is office manager finds time for many other duties. In addition to answering the telephone, she helps serve customers during busy hours and, as can be seen from the above picture, she is perfectly capable of operating the crusher and bagging crushed ice. Mr. Franklin started in the ice business 30 years ago as an ice deliveryman for the Bell Ice Plant at Lynchburg.

Ohio Ice Plant Converts to Cold Storage

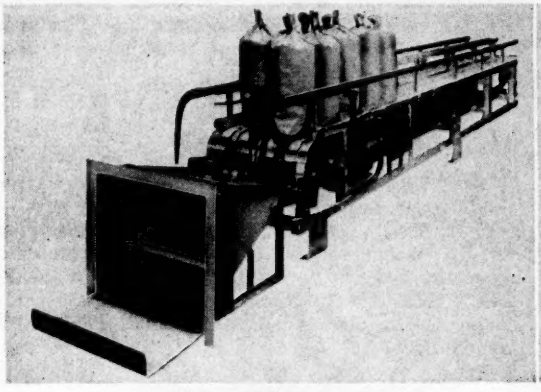
AFTER thirty years of continuous operation, the Wellston Ice & Cold Storage Company, Wellston, Ohio will quit making ice October 1 and the ice making equipment will be sold. Andrew J. Holzapfel, principal owner and general manager made the announcement. He plans to give all his attention to the cold storage business and wholesaling beer.

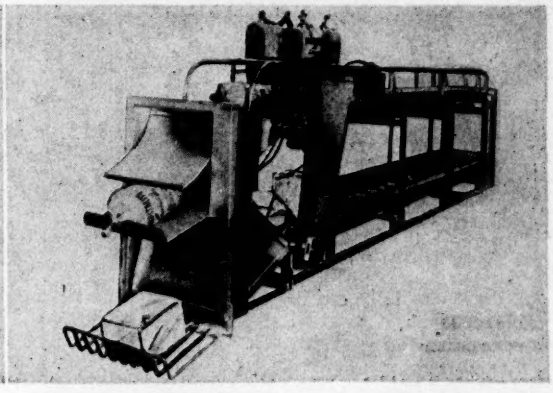
Safety Award Presented

NATIONAL safety awards were presented recently to 37 drivers of the Wisconsin Ice and Coal Co., Milwaukee, Wisconsin who have perfect safety records for one year or more. A special award went to Edward Hickey who has driven 17 years with no accidents.

American Ice Dividend

THE American Ice Company voted a dividend of $1.50 on the six percent non-cumulative preferred payable July 24 to stock of record July 10. Last year the company paid similar amounts on July 25 and September 26, and $3.00 December 12.





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NOW a new double-capacity Ice-A-Teria vending machine completes our line of vending machines. One or both of these machines can serve your complete vending needs.

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ARMSTRONG REFRIGERANT PURGER CAN DO ALL THIS

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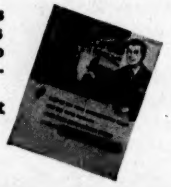
- Cut Power Consumption
- Cut Cooling Water Consumption
- Increase Compressor Capacity
- Save Labor
- Help Prevent "Ammonia" Explosions
- End Disagreeable, Smelly, Bothersome Hand Purging

BULLETIN No. 221, free on request, tells how Armstrong Purgers accomplish this impressive list of benefits. These are no idle claims. They are based on experiences of users.

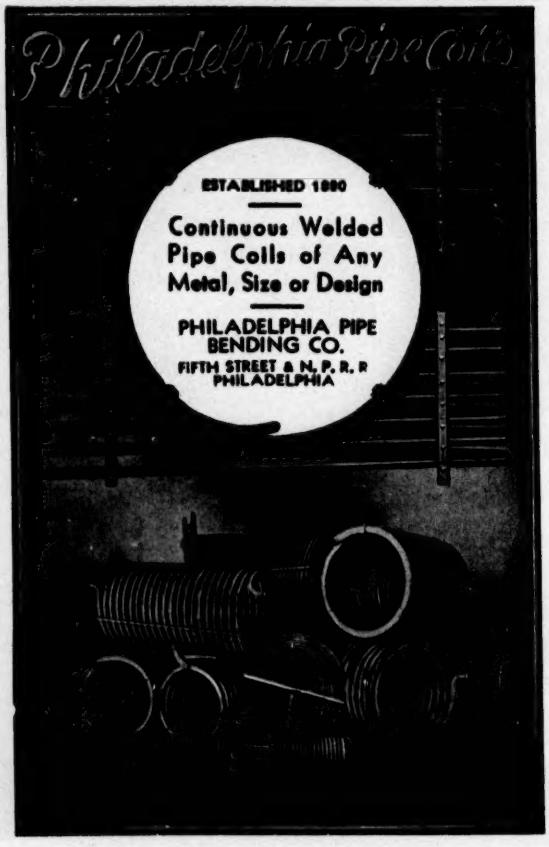
It costs nothing to learn about Armstrong Purgers.

Send for BULLETIN No. 221 *today.*



ARMSTRONG MACHINE WORKS

860 Maple Street, Three Rivers, Michigan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Continuous Welded Pipe Coils of Any Metal, Size or Design
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Canadian Wells Produce Dry Ice

BRITISH Columbia's newest industry, a carbon dioxide gas field near the interior town of Vernon, has received an order from the U. S. Atomic Energy Commission for 300,000 tons of "gas-ice." The unique industry is not yet producing, but Charles Gorse, president of the Gas-Ice Corp. (Canada) Ltd., said he expected the first commercial quantities to be ready in eight months, by which time the Mara Lake operation would represent a $500,000 investment.

Gorse based his speculation on the fact that the company had completed four producing wells in the Mara Lake field. The wells ranged in depth from 69 to 200 feet. Next winter, his engineer said, CO_2 charged water would come from the wells and would be converted first into snow and then dry ice.

Gorse disclosed that the Atomic Energy Commission first began sending orders as early as 1951 for dry ice for its Hanford, Wash., plant. The company plans to base its new industry on 40,000 acres of leased land in the British Columbia interior.

Spinach and Asparagus Packs Set New Record

ANOTHER big gain has been registered by the pack of frozen spring spinach. The 1953 pack moved up to 66,887,060 pounds—nearly 15 percent greater than last year's record high production. Production in the East and South advanced this year, and the Western pack continued moving upward, reaching another new record high.

The 1953 pack of frozen asparagus reached 32,198,082 pounds, a higher total than in any past year. A preliminary tabulation by the National Association of Frozen Food Packers indicates a pack increase of nearly 27 percent over 1952, with major producing regions in both the East and the West participating in the gains over last year. Production in the midwest, however, showed a reduction from 1952.

Industry and Research

INDUSTRY now spends more on agricultural research than the government does. Authority for that statement is Ezra Taft Benson, secretary of agriculture, writing in the July issue of "Agricultural Research." It is estimated that private industry spends 140 million dollars a year for agricultural research, about 30 per cent more than the state experiment stations and the USDA combined.

Refrigeration Inspector

A NEW post of refrigeration inspector has been created by City Council of Youngstown, Ohio. The Youngstown Building Trades Council and refrigeration contractors had appealed to council and the mayor for a refrigeration inspector in order to adequately enforce the building code.

Butter Retains Grade in Cold Storage

BUTTER purchased by the Commodity Credit Corporation between November 30, 1952 and March 31, 1953, and stored in public refrigerated warehouses, recently was regraded and of the 28.5 million pounds, less that one percent showed any change in grade. There was no spoilage and no loss.

Advertising Displays in Ice

Advertising displays frozen in a block of ice is a sideline of the Standard Ice Company of Arkansas, Little Rock.

New Portable Unit For Cooling Trucks

A NEW portable truck cooling unit has been developed by the Union Ice Company of San Francisco, Calif. It is 8 feet wide, 24 feet long and 11 feet high and contains four compartments, each of which will hold 35 blocks of ice. In the picture below are shown the canvas "tunnels" which have an arrangement that allows the cold air to flow into the top of the truck and the return air to leave through the bottom section. The unit is capable of cooling four trucks at a time. Each section is equipped with a 20 inch Sturtevant axel-flow pressure fan with a 8,000 cfm rating and one section can be operated independent of the others.

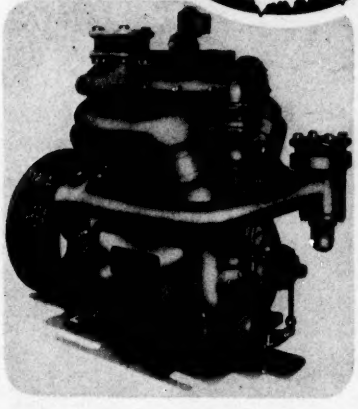
Test runs have proved the unit to be a very efficient truck cooler.

New portable unit truck cooler operated by the Union Ice Company, San Francisco, Calif.

PILOTLESS BOMBERS MADE WITH

TRADE FRICK MARK

AIR CONDITIONING



The Glenn L. Martin Company, builders of "Matador" bombers, "404" transports, and other famous planes, uses 27 Frick compressors for air conditioning and special cooling services in its great plant at Middle River, Md. These machines have been installed over a period of 16 years by the Paul J. Vincent Co., Frick Distributors in Baltimore.

For the last word in dependability and convenience, specify Frick air conditioning, refrigerating, ice making and quick freezing equipment. Let us quote on your cooling needs NOW.

Frick "ECLIPSE" Compressors Handle Air Conditioning Work with Extra Economy: ask for details.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO PENNA U.S.A.

Circle No. 36 on Reader Service Card

REFRIGERATION COMPRESSOR ACCIDENTS

Survey of 150 Accidents shows that valves and bearings of refrigeration compressors should receive special attention in preventative maintenance

VALVES and bearings should receive special attention in preventive maintenance programs for refrigeration compressors—according to the result of a recent survey made by The Hartford Steam Boiler Inspection & Insurance Company. A study of 150 accidents to refrigeration compressors showed that 101, or slightly more than two-thirds of the cases, originated with failures of valves or bearings.

The 150 accidents covered by the survey involved 96 ammonia and 54 freon machines. Only commercial-size (over 3 hp) reciprocating compressors were considered. They were located in plants such as: cold storage warehouses, ice-making plants, packing plants, dairies, breweries, and hotels. The study was confined to failures of the compressors only, and did not include accidents to motors or engines used to drive the machines.

Accidents Classified

As a starting point in the survey, the accidents were classified according to the part that failed first without regard to the damage that followed. If, for example, a valve broke and then jammed between a piston and cylinder head causing further damage, the case was classified simply as a valve failure. Or, if a bearing failed and scored the shaft journal, the case was classified as a bearing failure. Grouping the 150 cases in that manner produced the following results shown in Table 1.

Reprinted by permission from "The Locomotive," published by Hartford Steam Boiler Inspection and Insurance Company.

TABLE 1—INITIAL PART THAT FAILED

Part	No. of Cases
1. Valve, valve cage, etc.	65
2. Bearing	36
3. Piston or piston ring	14
4. Cylinder or cylinder head	11
5. Shaft	7
6. Miscellaneous	17
Total	150

As indicated in the table, failures of valves and bearings, taken together, accounted for more accidents than failures of all other parts combined.

Valve Failures

The next step in the survey was to study and classify the 65 accidents that originated with valve failures. In some instances the damage was confined to the valve, or parts of the valve mechanism. But in many cases, pieces of the broken valves jammed the machine, causing breakage of pistons, cylinders, cylinder heads or connecting rods. Repair costs as a result of these failures ran as high as $1,500, but the average cost was about $350.

The valve failures were classified according to cause with the results shown in Table 2.

Accidents listed in items 2 and 3 can be considerably reduced by a good maintenance program. Cracks in valve parts and loose bolts or other fastenings can often be discovered at regular maintenance inspections and corrected before final failure occurs.

TABLE 2—CAUSES OF VALVE FAILURES

Cause	No. of Cases
1. Cracks (in valves, valve cages, or other parts of valve mechanism)	26
2. Liquid refrigerant in cylinder	17
3. Loosening of bolts, nuts, screws, or other fastenings	12
4. Miscellaneous	10
Total	65

Damage from liquid carryover, item 2 in the table, occurs from a variety of causes, usually originating outside the compressor and having to do with operation of the system. Therefore, prevention of accidents from this cause is largely a matter of keeping expansion valves and controls in good working order, giving careful attention to starting procedures, and watching the signs of carryover. Frequently, carryover causes "clicking" noises in the machine before sufficient liquid enters to cause damage. Following some of the accidents included in this survey it was reported that plant employees had noticed "clicking" noises in the machines on many occasions, before final failure occurred. Such indications of liquid carryover should be recognized as signs of impending trouble.

Bearing Failures

Most of the bearing failures among the accidents included in this survey resulted from lubrication troubles, as shown in Table 3.

Fig. 1—Above, bearing of refrigeration compressor damaged as a result of faulty lubrication.

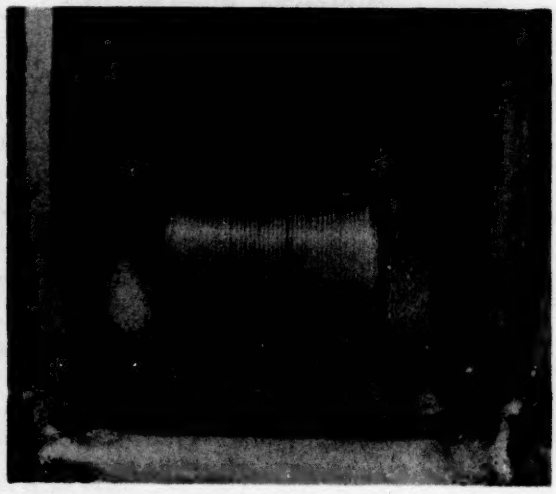


Fig. 2—Right, crank journal damaged by failure of bearing shown in Fig. 1.

Fig. 3—Broken parts of refrigeration compressor damaged by slug of liquid.

TABLE 3—CAUSES OF BEARING FAILURES

Cause	No. of Cases
1. Oil level not maintained	11
2. Dirt in oil, or oil line plugged	8
3. Failure of lubricating device	6
4. Oil leakage at seal, or other point	5
5. Valve in oil line closed	2
6. Misalignment	1
7. Cause undetermined	3
Total	36

As with most other types of machines, the chances of bearing failures in refrigeration compressors can be greatly reduced by a rigid program for checking the supply of lubricant and keeping it free of dirt and foreign matter. Many of the accidents in items 1 and 2 could have been prevented if such precautions had been taken.

The cost of these bearing failures varied widely, depending upon whether the damage was confined to the bearing itself or caused damage to the crankshaft, necessitating replacement of that expensive part of the machine. The average cost of repairing the compressors in the 36 cases listed in Table 3 was $720, but in some instances the cost ran up to several thousand dollars.

Conclusion

The purpose of this survey was to determine the leading causes of recent accidents to refrigeration compressors and, as previously indicated, the results showed that major emphasis should be placed on valves and bearings in the preventive maintenance program.

The remaining accidents listed in Table 1, totaling 49, involved failures of cylinders, pistons, shafts, etc. They resulted from a variety of causes and the number of cases in any one classification is not sufficient to set a pattern. However, two significant points were noted: 10 of these 49 accidents were caused by liquid refrigerant entering the compressors; and at least five of the cylinder failures resulted from lubrication troubles.

Empire State Building Adds Air Conditioning

TENANTS of the Empire State Building, New York City, may have their offices air-cooled through the warm weather without installing complete equipment, thanks to one of the largest air-conditioning plants ever constructed in a public building.

The unit, which was started in the fall of 1950, was built at a cost of approximately $1,500,000, according to John F. Garrety, vice president in charge of operations of the building.

Located in the sub-basement of the world's tallest building, it consists of four huge refrigerating machines, with a total capacity of 1900 tons. Eventually this will be extended to 3200 tons.

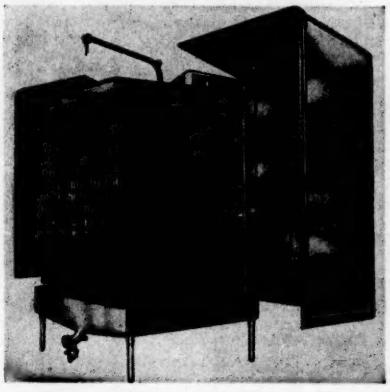
Chilled water is pumped through the building as high as the 85th floor, which the tenant may convert into air-conditioning through the use of his own air-handling unit.

A 350-ton machine pumps the chilled water through pipes from the basement to the fifth floor.

Two tremendous 650-ton machines pump cold water to all floors from the sixth to the 41st floors, while a second 350-ton plant sends water from the 42nd to the 85th floors.

Of particular interest to engineers is the cooling tower. This tower, standing about 125 feet high, consists of three chambers and chills the water used for cooling the refrigerating machinery, which, in turn, is used to process the chilled water.

The plant was designed by Edward Ashley & Co. of New York, consulting engineers. York equipment was used.



Pfeiffer's famous brew is quality protected by 4 Mojonnier WORT COOLERS

Pfeiffer Brewing Co., installed two 250 barrel and one 200 barrel per hour Mojonnier Hot Wort Coolers in their Detroit plant and a 100 barrel per hour unit in their Flint, Michigan plant for 4 excellent reasons. 1. These coolers thoroughly aerate the wort. 2. The advantages of direct-ammonia mean low cost cooling. 3. Smooth, one-piece construction of stainless steel cooling sections provides quick, easy cleaning and top sanitation. 4. Design is space-saving and flexible — offering means of adding cooling sections as additional capacity is needed.

• Mojonnier Hot Wort Coolers, used thruout the Brewing Industry range in capacity from 50 to 300 barrels per hour in single housings. For full information write today to:

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Exclusive Agent in the Brewing Industry: SCHOCK, GUSMER & COMPANY, Hoboken, New Jersey

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July 31 Cold Storage Holdings

JULY 31 public cooler occupancy, 61 per cent, was unchanged from a month earlier. Each month this year, cooler occupancy has been about equal to the monthly 5-year average (1948-52) levels but it has been running under the monthly levels of last year. In almost all of the States little or no change in cooler occupancy was reported from June 30 to July 31.

Freezer space occupancy on July 31 was 73 per cent or a gain of 3 points over the previous month. Last year, warehousemen reported an occupancy of 78 per cent but the 5-year average for July 31 is 72 per cent.

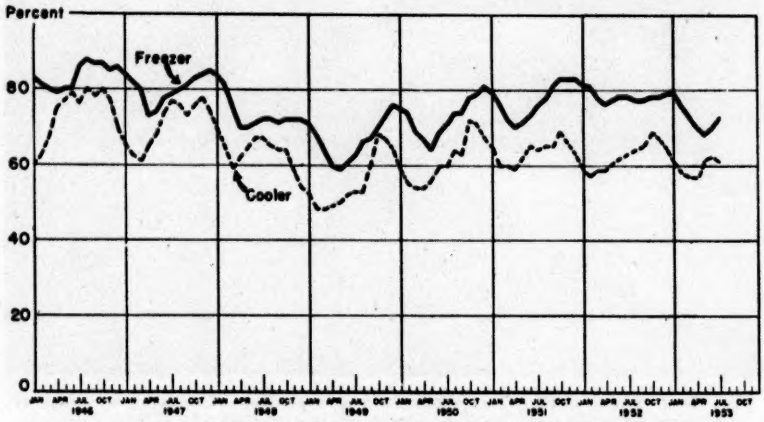
The July seasonal net gain in frozen fruit stocks set a new all-time record. Stocks were increased by more than 115 million pounds to reach a total of more than 292 million pounds by July 31.

Frozen vegetable stores were increased by near record amounts during July. An 81 million pound net gain raised national holdings to 465 million pounds, the largest amount ever reported in storage on July 31. These record stocks and near record gain is attributable largely to the increase in frozen peas, 97 million pounds, which brought national frozen pea holdings up to 193 million pounds.

A 54 million pound net increase in creamery butter stocks raised national holdings to almost 312 million pounds for a new record high. American Cheddar cheese holdings were also at a new record high with more than 383 million pounds reported in storage on July 31. Shell egg holdings were reduced during July by about 318,000 cases to bring national holdings down to 1.2 million cases which was an all-time record low for the month.

Frozen egg stocks fell off 5 million pounds to 154 million which compares with 163 million last year and 191 million pounds on July 31 in the 5-year period ended 1952.

The July net reduction in frozen poultry stocks was about half as great as average and only about one-third as last year. With only a million pound net decrease, total poultry holdings were down to 112 million pounds. Turkey holdings reflected a 9 million pound net reduction during July and by the end of the month stocks totaled 43 million pounds which were above average for this time of year but under last year's stocks.



END OF MONTH OCCUPANCY OF PUBLIC COLD-STORAGE WAREHOUSES, 1946-53

The July net disappearance of beef was twice the average and about equal to the net-withdrawals last year. Stores of beef were down to 151 million pounds, a net reduction of 26 million pounds. Although beef stocks were more than two-thirds above average for July 31, current holdings were 6 per cent under last year's total. Pork holdings totaled 341 million pounds which compares with 543 million last year and 462 million on hand July 31 in the 5-year average period ended 1952.

Cooler occupancy on August 31 should be above 61 per cent. According to the 5-year average pattern and the change last year, an increase of 1 point is expected. Freezer occupancy should also increase during August and by the end of the month a gain of 1 point is forecast by the 5-year average change.

TABLE 1—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	July 1953	June 1953	July 1952	Five Year Average
Beef	150,977	176,635	161,352	89,654
Pork	340,520	414,227	542,707	461,708
Other Meats and Meat Products	140,077	157,737	146,346	114,073
Frozen poultry, lbs.	111,876	117,876	157,045	105,910
Creamery butter, lbs.	311,737	257,447	99,751	130,822
American Cheese, lbs.	383,715	339,812	211,477	205,245
Other cheese, lbs.	24,218	24,026	21,819	22,651
Shell Eggs, cases	1,195	1,513	2.728	3,124
Frozen eggs, lbs.	154,284	159,755	163,359	190,939
Apples, bu.	123	306	153	178
Frozen fruits, lbs.	292,204	176,782	305,641	299,124
Frozen vegetables, lbs.	465,129	384,292	385,484	298,018
Frozen fish, lbs.	165,331	142,655	176,254	143,028

TABLE 2—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC COLD STORAGE WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling space (000 cu ft)		July 1953 (%)		June 1953 (%)		July 1952 (%)		5 year average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	3,280	7,106	45	66	46	61	37	72	43	70
Middle Atlantic	31,565	37,057	54	75	52	69	55	80	51	72
East North Central	27,144	25,945	74	83	74	82	77	80	74	72
West North Central	11,962	20,497	65	80	76	79	72	78	75	79
South Atlantic	11,302	13,442	55	58	63	64	66	78	65	75
East South Central	1,970	3,844	88	66	84	82	82	91	77	85
West South Central	7,433	9,249	69	74	73	73	65	63	66	60
Mountain	1,525	3,763	42	60	46	57	67	76	61	75
Pacific	15,784	30,595	51	68	47	59	51	75	48	68
United States	111 965	151,499	61	73	61	70	63	78	61	72

Book Review

COMMERCIAL AND INDUSTRIAL REFRIGERATION, By C. Wesley Nelson, Published by McGraw Hill Book Company, New York, 468 pages. Illustrated. Price $7.00. For sale by Nickerson & Collins Co., Chicago.

This book provides a practical approach to commercial and industrial refrigeration for those with a background of elementary physics who are interested in practical studies and practice. It stresses the practical application of principles, but the fundamentals just presented allow the student to apply his knowledge and familiarize himself with refrigeration terminology.

Divided in three parts it deals with elementary theory of refrigeration, classification and description of equipment, and installation and servicing. The theory and principles are general enough to apply to the more common types of refrigeration, while the descriptive material is made more particular. A number of illustrations are included which serve to help the reader visualize the subjects discussed.

In addition to the usual basic material covered in refrigeration texts the author has added several new features: a chapter on AC and DC motors used in the industry; low temperature refrigeration with methods of automatic defrosting; load calculations and selection of equipment; installation and service procedures; and three chapters on air conditioning.

Book Review

INTO THE FREEZER AND OUT. Second Edition, By Donald K. Tressler, Clifford F. Evers and Barbara Hutchins Evers. Published by the Avi Publishing Company, New York. 246 pages. Illustrated. Price $3.75. For sale by Nickerson & Collins Co., Chicago.

Since this book was first published in 1946 there has been a persistant demand for a new edition. Accordingly, the authors have revised and brought it up to date. It contains authoritative information on freezing foods in the home, writen by frozen food experts, and the preparation, cooking, and serving of frozen foods. It covers every phase of the subject, from the selection of the right type of freezer for individual needs, through the handling and packaging of frozen foods, to the storage and serving of the various products. For the homemaker who owns a freezer or plans to purchase one, for locker plant operators, for locker plant patrons, home economists and others interested in food preservation, this book contains much valuable information. A complete index makes it readily available as a reference.

Fire Damaged Warehouse Will be Rebuilt

THE cold storage warehouse and plant of the East Farms Packing business, 16 miles east of Spokane, Wash., which was almost totally destroyed by fire in July, will be rebuilt according to H. N. Segerstrom, owner. Damage amounted to $350,000. Explosion of a gas pot being used for heating tar in repairing the roof of the building caused the fire.

City Products Gains

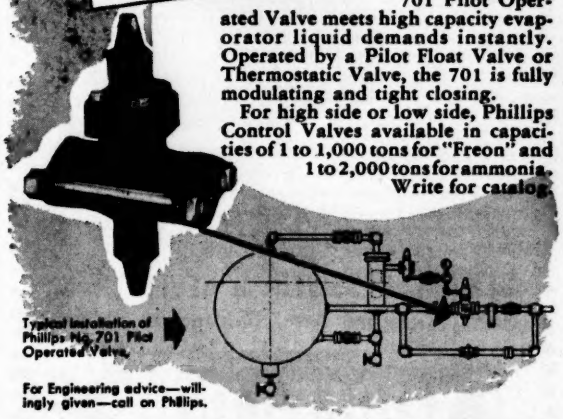
BOTH sales and net earnings of City Products Corporation for the first six months of 1953 are somewhat higher than for the same period of 1952, according to figures released by Wm. J. Sinek, president. Net income after federal taxes for the first six months of 1953 amounted to $1,365,236 or $1.08 per share as compared with $1,307,511 or $1.04 per share in the same period last year.

REFRIGERANT SUPPLY MEETS DEMANDS... Automatically with PHILLIPS FLOAT CONTROLS

PILOT OPERATED LIQUID CONTROL VALVES

The Phillips No. 701 Pilot Operated Valve meets high capacity evaporator liquid demands instantly. Operated by a Pilot Float Valve or Thermostatic Valve, the 701 is fully modulating and tight closing.

For high side or low side, Phillips Control Valves available in capacities of 1 to 1,000 tons for "Freon" and 1 to 2,000 tons for ammonia. Write for catalog.



Typical installation of Phillips No. 701 Pilot Operated Valve.

For Engineering advice—willingly given—call on Phillips.

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REPRESENTATIVES: The C & S Equipment Co., 2103 S. San Pedro St., Los Angeles, Cal. • Mason Emanuels Co., 90 Dearborn St., Seattle 4, Wash.

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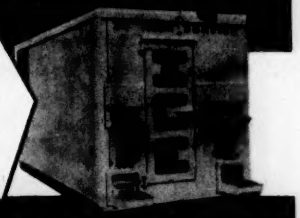
AUTOMATIC! REFRIGERATED! DEPENDABLE!



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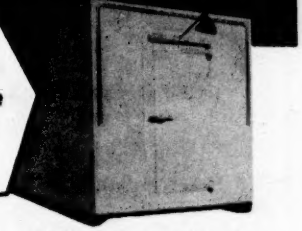

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Sold by Leading Ice Equipment Distributors Throughout the Nation

S&S VENDING MACHINE COMPANY
670 Lincoln Avenue San Jose, California

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News of PEOPLE

W. G. ZARUBA has returned to his position as assistant sales manager of Armour and Company's Ammonia Division after completing a second tour of duty in the U. S. Navy. Mr. Zaruba started with Armour in 1941. Soon after he entered the service. Upon being discharged in 1945, he returned to Armour as a member of the Technical Sales Service department of the Ammonia Division. In July, 1951, he was recalled by the Navy and served as operations officer of a destroyer squadron and later as executive officer of a destroyer.

WILLIAM J. HOOVER, a new staff member of The Refrigeration Research Foundation, began his services the first of July as assistant to the Director in the office at Colorado Springs. A number of members became acquainted with him at the Annual Meeting in Washington. Bill is a young man starting his career in his chosen profession of food technology. He has just received a Master's degree in that new field at the University of Illinois, under the guidance of Dr. L. B. Howard, public member of the Foundation's Board of Governors. He is married and has a young son.

Bill is eager to become acquainted with Foundation members and with the work of the Foundation, and members may expect to become acquainted with him and hear from him as time goes on. The expanding program of the Foundation, its extension into broader fields and its need for more detailed and thorough investigation of promising new fields of activity, will make Bill's services very valuable and will enable the Director to use his own time to greater advantage.

ROY A. ESPE, has been appointed sales engineer for Burge Ice Machine Company, it was announced early in August by Al M. Reilly, general manager. Mr. Espe comes to the Chicago firm with considerable experience in industrial refrigeration around the Chicago area. He entered the refrigeration field in 1927 with Westerlin and Campbell Company, moving to Northwestern Yeast Company in 1940 in charge of engineering and plant operation. In 1946, Roy Espe joined the Buildice Company as an engineer and shifted in 1951 to the Julian Company.

LOUIS P. STARR, after thirty-five years in the refrigeration transportation field, has left the Alaska Steamship Co. at Seattle, Wash., for golf and retirement, the pursuit of hobbies and pleasures of a warmer nature.

Merger of Beatrice Foods And Creameries of America

AT SPECIAL meetings held July 24, 1953, stockholders of Beatrice Foods Co. and Creameries of America, Inc., approved a plan whereby Creameries of America was merged into Beatrice Foods Co., effective August 1. Under the terms of the merger holders of Creameries common stock will receive one share of new $100 par 4½ percent preferred stock and one share of Beatrice common stock for eight shares of Creameries common stock. The exchange will require the issuance by Beatrice Foods Co. of 81,250 shares of new preferred stock and 81,250 shares of authorized but presently unissued common stock. The new Beatrice 4½ percent preferred stock will be non-callable until July, 1956.

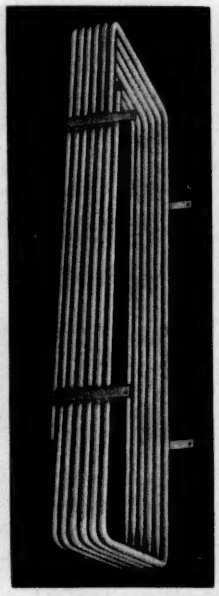
Outlook For Apples

THE United States Department of Agriculture reports that the outlook for apples in commercial counties for 1953 is for a crop above that of 1952, but below average. Indications point to an increase in the central states and a slight decline for the eastern and western states.—Cold Facts.

PIPE BENDING & COIL FORMS

Single bends, coils or pipe fabrications—whatever you need, our master metal-workers can produce them to your exact specifications. Even in stainless steel, or up to 6-inch extra heavy! For quality work *when you need it*, call on us!

We'll gladly quote on your next job.



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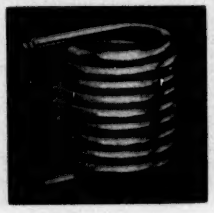

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Best in the field for 73 years!

WOLF-LINDE Screw End Ammonia Valves of high-strength semi-steel, feature, up to 1", threaded bonnets with 1-piece hardened and ground stems, and above 1", bolted bonnets with soft seat disc. All have back seating. Also available: scale traps, standard and special ammonia fittings. We invite your inquiry.

DERSCH, GESSWEIN & NEUERT, Inc.

4849 W. Grand Ave., Chicago 39, Illinois

WOLF-LINDE VALVES

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DEATHS

Solomon Joel Drapekin

THE death of Solomon Joel Drapekin, New Orleans, La., who has been general manager and secretary of the New Orleans Cold Storage Warehouse Co. for the past 39 years, occurred August 9 after having been stricken with a heart attack while at the New Orleans Athletic Club. A native of Philadelphia, Mr. Drapekin came to New Orleans when he was 27 years old. He was an active civic worker, Mason, a member of the Chamber of Commerce, the Grand Consistory of Louisiana, life member of the William Warren Lodge No. 207, Free and Accepted Masons, Chicago; Audubon Golf Club, and the Lakewood Country Club. He is survived by his widow Mrs. Beulah Drapekin; a son, Charles L. Drapekin, New Orleans; and a daughter, Mrs. William Lehman of Orange, N. J.

CONRAD A. BUCHER, aged 78, retired treasurer of the old Youngstown Ice Co. and the Youngstown Building Material & Fuel Co., Youngstown, Ohio died July 1.

MALCOM H. ZIMMERMANN vice-president and general manager of the New Haven Cold Storage and Warehouse Company, New Haven, Conn., died February 6 after a short illness. He was 44. Mr. Zimmermann graduated from Yale University in the class of 1929 and did graduate work at Pratt Institute, Brooklyn, after which he specialized in air conditioning and refrigeration. In January 1950 he helped form and organize the New Haven Cold Storage and Warehouse Company, becoming vice-president and general manager.

WILLIAM F. HELM, vice-president of the Empire Cold Storage & Ice Company, Kansas City, Mo., died July 22 after a brief illness. He was 78. Mr. Helm helped establish the Empire company 30 years ago. Before he retired four years ago, he was active in civic clubs, member of the Chamber of Commerce and a director of the Commerce Trust Company.

JOSEPH WESLEY POWELL, president of the Cold Spring Storage Company, Buffalo, N. Y. died June 8 at age of 58. He had been ill since January. Mr. Powell had been associated with the Cold Spring Storage Company since shortly after World War I. He became president after the death of his father.

WILLIAM SEMAR, Seattle, Wash., former president of the Northland Transportation Co., died the latter part of August. He was 66. Mr. Semar founded the Northland Transportation Co. operating both passenger and freight service to Alaska until 1946, when the Northland organization was absorbed by the Alaska Steamship Co. After this he engaged entirely in the cold storage field, with operations extending from Seattle to Alaska.

JOSEPH F. SCOTT, deputy director in charge of the mechanical engineering bureau of the New Jersey State Department of Labor and Industry, died August 5 after a short illness. Some years ago he was connected with the Fred Wolfe Co. and deLaVergne, makers of refrigerating machinery, and later with the Crystal Ice & Supply Co., Dover. He entered state service in 1915.

GEORGE L. POWNALL, well known in the ice industry as an inventor of ice making systems, including the "Kold-erol" ice can for making clear ice cylinders, and a rotary compressor, died in Cincinnati recently. He was a victim of poor health from his World War I days, especially since the death of his wife some ten years ago.

Monarch
MODEL 50

Bateman
All-Steel
ICE CRUSHER

The Bateman all steel MONARCH Model 50 Ice Crusher is galvanized for the prevention of rust. Slanting hopper for easy loading, with shelf for placing ice on before entering crusher. Hopper opening — 12½"x15". Uses 1 HP. motor with V-belt drive. All moving parts move on either ball or roller bearings. Gears are of alloy steel hardened for long life and trouble free. Steel shell, legs, grates, grate handle and alloy steel teeth. Belts and pulley furnished when crusher is ordered without motor. Side plates and bottom of hopper 3/16" steel.

Price $235.00, less motor. Motor at prevailing price.

Bateman
Write For Details
Mineral Wells, Texas
Ice Processing Equipment

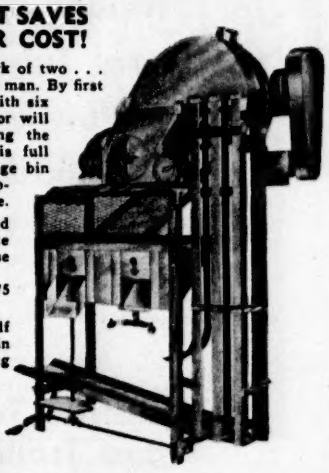
Bateman Automatic
LOADER CRUSHER

CRUSHER ICE UNIT SAVES TIME AND LABOR COST!

One man can do the work of two . . . loader acting as the second man. By first loading the hopper slide with six 50-lb. blocks of ice, operator will not have to bother loading the crusher and can devote his full time to bagging ice. Storage bin under crusher will hold approximately 100 lbs. of ice.

ELEVATOR: Is so timed as to allow each block of ice to be crushed before the next block enters crusher. Crusher is set to grind 175 lbs. a minute.

BAG HOLDER: A half ring holds the top of bag in place while bottom of bag sits on floor or platform.



FOOT-OPERATED DOOR FOR LOADER CRUSHER

Operator can fill paper bags at a very fast rate for each magazine of ice used. Operator holds bag with both hands, pushing down on foot lever will open the chute allowing the ice to flow into the bag. When the proper amount of crushed ice is in the bag, operator removes foot from pedal cutting the flow of ice off. The operator while he has the bag in this position can tie the bag while the bin is being filled for another bag.

Elevator can be stopped at any time to allow the operator more time if needed.

LOADER CRUSHER $715.00
(¾ h.p. motor at prevailing price)
F.O.B. Mineral Wells, Texas.

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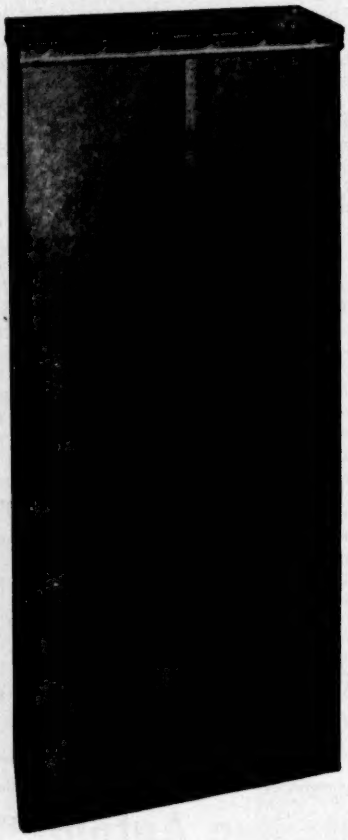

Welded Cans
Integral Tube Cans
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Condenser Trough

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Industrial Trucks and Trailers

THE OHIO GALVANIZING & MFG. CO.
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Circle No. 43 on Reader Service Card

CATALOGS AND BULLETINS

Indicator Catalog

COMPLETE information about how manually-operated portable and panel indicators are being used to precisely measure temperature, electrolytic conductivity or pH is contained in a new 24-page catalog, "L&N Manually-Operated Indicators for Temperature, Electrolytic Conductivity and pH Measurements", published by Leeds & Northrup Company.

This publication describes the design and operating accuracy of these indicators which are direct reading in terms of the variable under measurement. A feature of this catalog is the convenient arrangement of instruments according to application. Circuit diagrams show how they operate. Choice of equipment is made easy by listing in tabular form all specifications for both the indicators and accessories. Besides pictures of each indicator, the catalog also contains typical installation photographs.

For additional information, Circle No. 72 on Reader Inquiry Card.

Refrigeration Fittings Catalog

THE NEW, master catalog of Madden Brass Products is just off the press and ready for distribution to the refrigeration industry, according to a recent announcement by company officials. The Madden line which covers a complete range of refrigeration fittings, valves and accessories, charging lines, driers and strainers, has been expanded to include additional sizes to meet demands of the trade. New Madden items are also included in this latest catalog.

Also available from the company is a condensed version for the jobber trade. Both publications may be obtained by simply writing for them. Address request to: Madden Brass Products Co., 1111 North Franklin Street, Chicago 10, Ill.

For additional information, Circle No. 69 on Reader Inquiry Card.

Anhydrous Ammonia Manual

A NEW, 20 page, illustrated manual, "Guide to the Use of Anhydrous Ammonia", has been produced for the users of this chemical, by the Nitrogen Division, Allied Chemical & Dye Corporation. The manual describes the physical and chemical properties, and specifications of anhydrous ammonia in cylinders, and covers its principle applications, handling and operating techniques, and safety instructions to be observed.

In addition, the manual gives detailed instructions on linking cylinders together to achieve the most economical operating results. Charts, technical drawings and specifications are included to guide the user. Copies may be obtained by writing to Nitrogen Division, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, New York.

For additional information, Circle No. 68 on Reader Inquiry Card.

Cooling Tower Bulletin

A FOUR-PAGE bulletin on residential cooling tower is now available from Halstead & Mitchell of Zelienople, Pa. Describing in detail the basis of the 20-year guarantee on the wetted deck surface against attack by rotting or fungus growth, the bulletin is illustrated with cutaway views and line drawings which detail the mechanical features of these units. A comprehensive specification table presents cooling tower nominal ratings for both 780 and 750 wet bulb temperatures.

For additional information, Circle No. 73 on Reader Inquiry Card.

Calcium Chloride Manual

A NEW expanded and revised 64 page edition of its Technical & Engineering Bulletin No. 4 — "Calcium Chloride In Refrigeration", is announced by Solvay Process Division, Allied Chemical & Dye Corp. The announcement states that this sixth edition contains many revisions and additions, including tables, graphs and a new section giving specific data on various industrial and commercial applications of calcium chloride refrigerating brines.

For additional information, Circle No. 71 on Reader Inquiry Card.

COMING CONVENTIONS

INTERNATIONAL APPLE ASSOCIATION
October 10-13, 1953
Sherman Hotel, Chicago

WESTERN REGIONAL FROZEN FOOD CONVENTION
October 11-13, 1953
Palace Hotel, San Francisco
PAUL CAMPI, President

INTERNATIONAL ASSOCIATION ICE CREAM MANUFACTURERS
October 28-30, 1953
Statler Hotel, Boston, Mass.
ROBERT HIBBEN, Exec. Secy.

CANADIAN ASSOCIATION OF ICE INDUSTRIES
November 2-5, 1953
Seigniory Club, Montabello, Quebec
MILDRED E. CROFT, Secy.-Treas.

REFRIGERATION AND AIR CONDITIONING EXPOSITION
November 9-12, 1953
Cleveland Public Auditorium
GEORGE S. JONES, Managing Director
Air Cond. & Refrig. Inst.

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 11-13, 1953
Purdue University, Lafayette, Ind.
J. RICHARD KELAHAN, Secretary

NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 17-20, 1953
Hotel Statler, Washington, D. C.
GUY W. JACOBS, Exec. Secretary

DELTA STATES ICE ASSOCIATION
December 6-8, 1953
Arlington Hotel, Hot Springs, Ark.
R. N. MILLING, Secretary

REFRIGERATED WAREHOUSEMEN FALL MEETINGS

Northwest Chapter NARW, Portland, Oregon. October 12. Chairman, Alex Ollson, Terminal Ice & Storage, Portland.

South Pacific Chapter NARW and Pacific States Cold Storage Warehousemens' Association, Chapman Park Hotel, Los Angeles, Calif. October 15-16. Chairman, A. R. Carstensen, Sacramento.

Southwestern Chapter NARW Gunter Hotel, San Antonio, Texas. October 19-20. Chairman, William Rylee, Denison, Texas.

Institute of American Poultry Industries Fact Finding Conference

THE Institute of American Poultry Industries will hold its silver anniversary Fact Finding Conference February 13, 14 and 15, 1954, in Kansas City, Mo., Dr. Cliff D. Carpenter, Institute president, has just announced.

"We're looking" Dr. Carpenter added, "for a new site for the 1955 Conference, however, to give people a change of scenery. For the past eight years Kansas City has played the role of host for these Conferences in a very fine way—but it seems it's time to try another location if we can find one with adequate hotel and auditorium facilities."

Since a four-day Conference keeps too many people away from their businesses too long—in some cases as much as six days—the 1954 schedule calls for three days only—Saturday, Sunday and Monday.

Program workshops will also be shortened to two-hour sessions, since there's a limit to how much information a man can absorb at "one sitting." And the calendar of special events—such as breakfasts, luncheons, open house, and the like—will be entirely revamped.

"We may even skip the banquet next year," concluded Dr. Carpenter, "and go to some other type of entertainment we've never tried before. But our main concern will be the same as always—lining up a crackerjack, factual program and exhibit.

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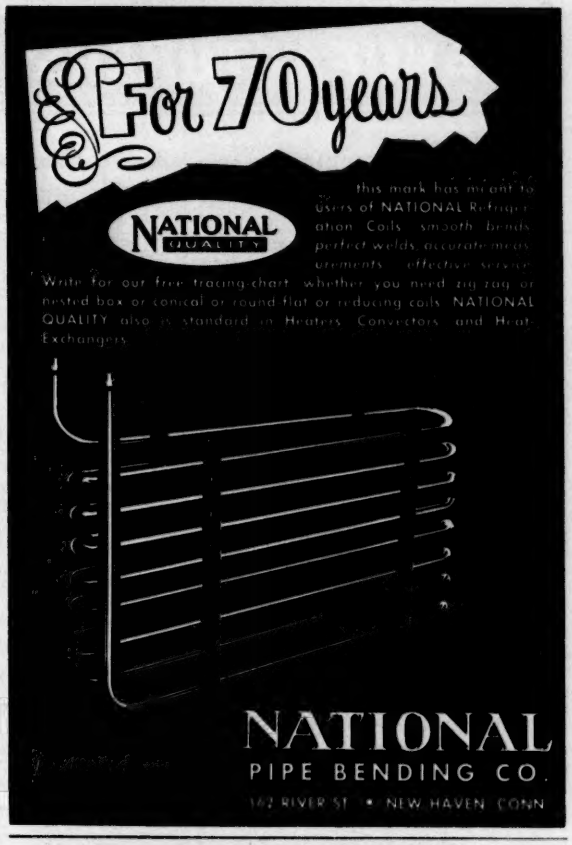
For 70 years
this mark has meant to users of NATIONAL Refrigeration Coils smooth bends perfect welds accurate measurements effective service
NATIONAL QUALITY
Write for our free tracing chart whether you need zig zag or nested box or conical or round flat or reducing coils NATIONAL QUALITY also is standard on Heaters Convectors and Heat Exchangers
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PIPE BENDING CO.
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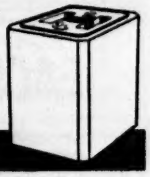
"Kooler Kubes solved our problem of clogged brine spray nozzles . . . and since Kooler Kubes are specially heavily compressed . . . they dissolve evenly to keep brine at a uniform salometer reading. And with Kooler Kubes we don't have to add salt as frequently . . . we now use much less salt."
ELDRED PERRY, *Supt.*
Municipal Abattoir
Austin, Texas

Kooler Kubes are special, heavily compressed 50-lb. refrigeration salt cubes for unit coolers, brine spray cold diffusers, and spray deck systems.
*Trademark International Salt Company, Inc.



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☐ Please have a representative call.
☐ Please send additional information.

Signed:
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Company_____
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City_____ Zone____ State____

Circle No. 45 on Reader Service Card

MANUFACTURERS' NEWS

Henry Valve Appoints New Salesmen

FOLLOWING the resignation of Gordon Wheeler, sales representative, Henry Valve Company has announced a realignment of territories involving factory salesmen Berthold Rossnagel,

B. Rossnagel

J. R. McCahill

Dayton, and J. R. McCahill, Chicago. Mr. Rossnagel will now represent the company in Kentucky, Michigan, Ohio, West Virginia, Western Pennsylvania, and Indiana, except Lake County, and Ontario Canada. Mr. McCahill will travel in Illinois, Eastern Iowa, and Eastern Missouri, Minnesota, Wisconsin, and Manitoba, Canada.

Acme Names New Officers

ACME Industries, Inc., Jackson, Mich., manufacturers of air conditioning and refrigeration equipment, has named Peter A. Weatherwax as vice-president and Frank M. Reed as secretary-treasurer. Mr. Weatherwax, formerly secretary-treasurer, will also function as assistant to the president. Mr. Reed was formerly controller and assistant secretary-treasurer.

Fire Damages Baker Plant

FIRE, fanned by high winds, raced through the three-story brick building housing the Baker Refrigerating Company plant, South Mindham, Me., causing $500,000 damage. The plant, which was fully covered by insurance, will be rebuilt.

Trane Names Dallas Manager

THE Trane Company, LaCrosse, Wis., manufacturer of air conditioning, heating and ventilating equipment, has named A. James Hackl as the manager of its Dallas sales office.

Du Pont Expands Plants

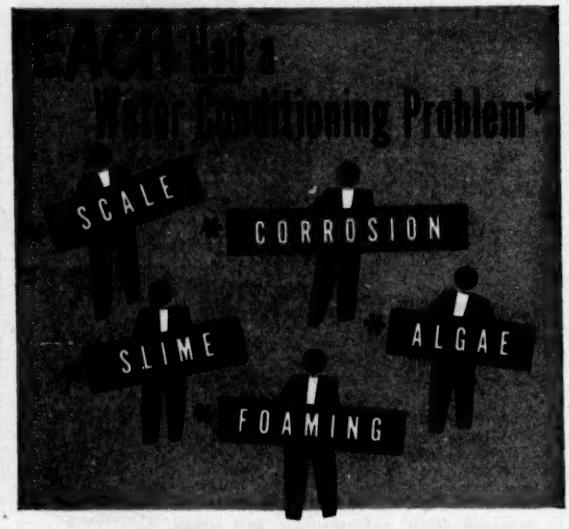
A TWO million dollar expansion program at two plants manufacturing "Freon" fluorinated hydrocarbon compounds for the refrigeration and aerosol industries has been announced by the Du Pont Company.

Major part of the new manufacturing facilities will be located at the Chamber Works plant of the Organic Chemicals Department at Deepwater Point, N. J. Ground was broken there late this month for a four-story building and service facilities, scheduled to go into operation next April.

Booklet Observes Ideal Anniversary

FIFTY Years of Creative Electrical Engineering (1903-1953) is the title of an attractive booklet issued in observance of the golden anniversary of the Ideal Electric & Manufacturing Company, Mansfield, Ohio. A letter from S. Glen Vinson, president, sketches the growth of the company and expresses thanks to the customers and employees who have made its success possible. Text and illustrations give a brief and readable history of the company from its start in an old Mansfield buggy shop in 1903, to its present complete line of motors, generators and other equipment. The booklet is attractively printed on heavy enameled paper and is well illustrated.

For additional information, Circle No. 70 on Reader Inquiry Card.



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Wright never offers a "cure-all" . . . your water conditioning problems are individually studied and analyzed by our technical staff. The answer to each problem is contained in a complete personalized report prepared especially for you. After you adopt our recommendations, constant field and laboratory checks insure proper economical performance. Write or call collect today for a complete survey of your individual water conditioning problems.

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633 WEST LAKE STREET, CHICAGO 6, ILLINOIS
Offices in Principal Cities
Distributors of Nelson Chemical Proportioning Pumps and Refinity Softeners and Other External Treating Equipment.

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IS NOW YOUR "ONE STOP" HEADQUARTERS FOR

REPLACEMENTS FOR *ALL* CLEAR RAW WATER ICE MAKING SYSTEMS, INCLUDING MARTOCELLO, MADE FROM THE ORIGINAL ENGINEERING DRAWINGS AND PATTERNS. ALSO REPLACEMENTS FOR YORK AND FRICK SYSTEMS.

COMPLETE STOCKS; PROMPT, COURTEOUS SERVICE.

STOCK ORDERS SHIPPED SAME DAY THEY ARE RECEIVED.

ICE

SIZERS	VENDING STATIONS
CRUSHERS	TONGS
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VENDERS	PICKS
CUBERS	BAGS

ETC.

Write, Wire or Telephone

ICE PLANT EQUIPMENT CO., Inc.
2543 Frankford Avenue Nebraska 4-3055
Philadelphia 25, Pa.

Circle No. 47 on Reader Service Card

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings. $15.00 per inch for line listings.

POSITIONS AND HELP WANTED

WANTED—Operating Engineer for new 40-ton electric one man ice plant, located in East Tennessee. Car icing only. Give full qualifications. Address Box SP-9, Industrial Refrigeration, 435 N. Waller Ave. Chicago 44, Ill.

ICE PLANTS—WANTED & for sale

BUSINESS OPPORTUNITY—Wishing to retire from active business which was established in 1896 in Media, County Seat of Delaware County, Penna., wish to sell retail coal, feed, building material, domestic fuel oil and ice delivery business. Five acres land, railroad siding, large stone construction ice storage. Thirty thousand gallon capacity domestic fuel oil storage. 40 tons ice making capacity with sized ice equipment complete. Two electric driven Frick machines. Write for further details. Media Coal & Ice Co. Inc., Media, Pa.

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20 tons to 150 tons.
AMMONIA COMPRESSORS
12½x14½ York, ⅓ & ⅔ capacity control.
10x10 York, 300 r.p.m.
8x8 York, V-belt drive to 75 h.p. motor.
7½x7½ York, V-belt drive to 60 h.p. motor.
6x6 York high speed, 3x3 York, self contained unit.
11½x8 Frick Booster compressor, V-belt drive, to 50 h.p. motor.
MISCELLANEOUS EQUIPMENT
130 h.p., 3 cylinder Superior Diesel engine, 600 r.p.m.; 75 h.p. motor, 720 r.p.m.; Uline scoring machine; Gifford Wood ice sizing unit; Type 50 F & E cubing machine; blowers, agitators, M.G. sets, ice cans 11½x22½x44" low pressure, 11½x 22½x45" high pressure.
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"A" & Venango Sts. Philadelphia 34, Pa.
Phone GArfield 6-2221

FOR SALE—Going Ice Business, including truck icing and FGE car icing contract. Selling more than capacity. Plant completely remodeled in last five years. 12,000 cu. ft. zero storage new 1953. In Florida. Write Box No. SP-15, Industrial Refrigeration, 435 N. Waller Ave., Chicago 44.

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USED EQUIPMENT—wanted & for sale

FOR SALE—9" x 9" Frick compressor, high speed, FF lubrication—completelly rebuilt. 36" x 15' vertical condenser, 140-2" tubes. 30" x 16' vertical condenser, 92-2" tubes. Both retubed since used. 36" x 16' horizontal 8-pass 136-2" tubes. 46" x 15', 220-2" tubes, 10-pass. Both excellent condition. Also 30" x 16' receiver. Box SP-12, Industrial Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

WANTED—100 h.p. slip ring motor open type, 2300 V., 60 cycle, 3-phase, including all starting apparatus, plus slide rails. Beard Ice Co. 46-48 College St., Danville, Ill.

FOR SALE—Vogt 18 ft. shell and tube condensers, $200.00, York 9x9 with Troy steam engine, $450.00. Frick 10x10 with 75 h.p. synchronous motor, $900.00. York shell and tube 18 ft. with 40-1¼ tubes, $400.00. Write us your needs in refrigeration. Gordon Equipment Co. 6530 W. Jefferson Ave., Detroit 17, Mich.

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350 Cans, 11x22x49, ready mounted in new grids. These cans are new having been in use only three months. Each grid contains seven cans. Also, one 6½ x6½ Vilter compressor in excellent condition. Rolling Mill Scrap, Inc. 802 S. Waugh St., Kokomo, Indiana.

FOR SALE—218 ice cans outside dimensions 44"x11½"x22½". Cubing saw, 7 saws; hand tiering machine, 5 tiers; Gifford Wood scoring machine; condensor 18" diameter x 12', 4 pass; receiver 16½" diameter x 7' with sight glass. Air blower rotary type, 3 h.p., 2 phase, 2" pipe. Agitator; 2 automatic valves for flooded system. Tyler Bros., Villisca, Iowa.

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FOR SALE—Four year old high speed force lubricated 9x9 Frick ammonia compressor and 6x6 Frick ammonia compressor splash lubricated, 300 r.p.m. with 20 h.p. V velt drive motor. Shawnee Ice Company, 306 S. Beard St., Shawnee, Okla.

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FOR SALE
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SLOW SPEED
2—8x8 Yorks
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1—8x8 Frick
1—9x9 Artic
1—10x10 Frick
1—6x6 York
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1—9x9 Frick
2—10x10 Yorks
1—10x10 FRICK with 125 H.P. Syn. Motor
1—70 ton horizontal SHELL AND TUBE CONDENSER
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2 sets twin 9x9 YORKS with 175 H.P. Syn. Motor
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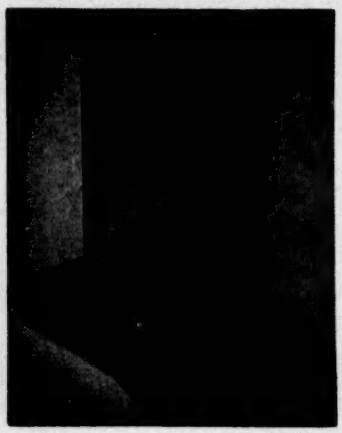

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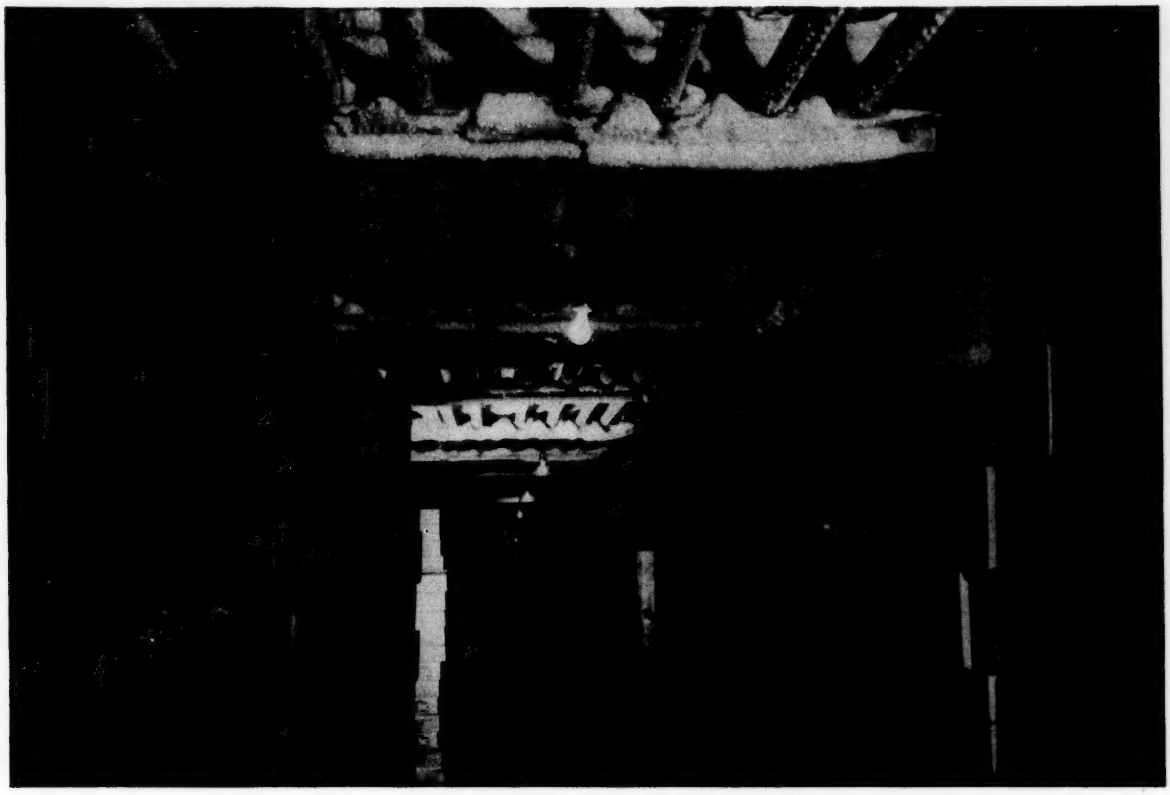

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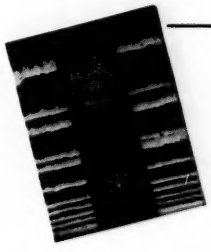

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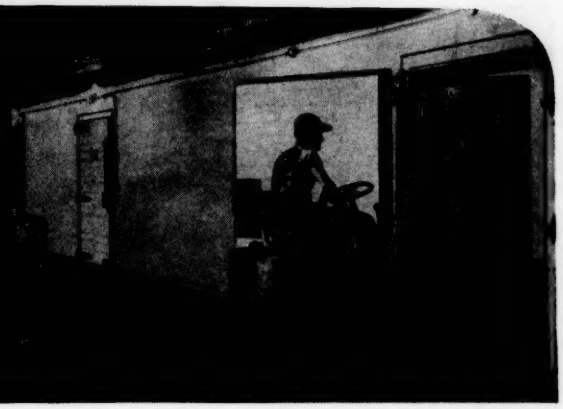

5'6" x 7'6" DOORS PROVIDE ADEQUATE CLEARANCE FOR ELECTRIC TRUCKS. Truck operator nudges door open without dismounting. Heavy No. 14 gauge galvanized sheet steel protects lower four feet of Vestibule Doors. Upper portion of doors is protected by No. 20 gauge steel.

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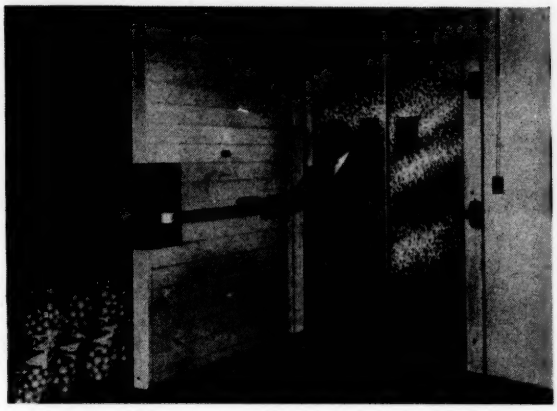
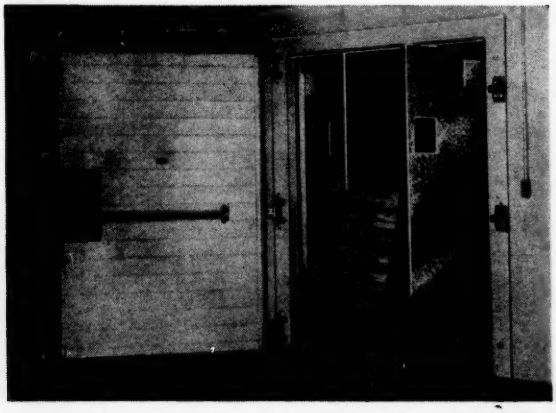
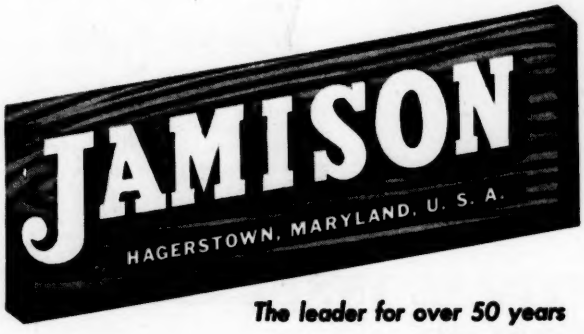
Jamison Doors invite and challenge comparison. Compare the construction features of these doors yourself. Write today for catalog. JAMISON COLD STORAGE DOOR CO., HAGERSTOWN, MD., U.S.A.



BUMP OPEN BAR OPENS COLD STORAGE DOOR FROM INSIDE. A push on the vestibule door from the inside contacts the bump open bar. As bar is depressed, fastener releases hold on door. Doors can be opened from inside without manually operating the fastener. Mr. M. Rabinowitz, Gen. Mgr. of Associated Grocers, points to Bump Open Bar.



HEAVY COLD ROLLED STEEL SHAFT SUPPORTS DOORS FROM TOP TO BASE. A two-way gravity cam automatically closes batten doors, keeping loss of cold air at a minimum during in-and-out traffic.



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